ANNUAL REPORT

for the fiscal year
ending March 31, 1987

Department of Mines and Energy

90-00513/

PROVINCE OF NOVA SCOTIA
DEPARTMENT OF MINES AND ENERGY

The Honourable Alan R. Abraham, CD
Lieutenant-Governor of Nova Scotia

Sir:

I have the honour to submit herewith the Annual Report of the Department of Mines and Energy of the Province of Nova Scotia for the period April 1, 1986, to March 31, 1987.

Respectfully submitted,

Joel R. Matheson, QC
Minister of Mines and Energy

PROVINCE OF NOVA SCOTIA
DEPARTMENT OF MINES AND ENERGY

The Honourable Joel R. Matheson, QC
Minister of Mines and Energy

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I have the honour to submit herewith the Annual Report of the Department of Mines and Energy for the period April 1, 1986, to March 31, 1987.

Respectfully submitted,

John J. Laffin

John J. Laffin, PEng, FEIC
Deputy Minister

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DEPUTY MINISTER'S REPORT

John J. Laffin, PEng, FEIC

The Department of Mines and Energy has a broad mandate to encourage research and development leading to increased energy and mineral resources and to promote their orderly development, regulation and use. To accomplish this, the Department manages a wide variety of projects and programs from energy conservation to mineral deposit investigations. The Department provides many services to the people of Nova Scotia, industry, and government agencies. Much of this work is assisted and supported by co-operative federal-provincial agreements. At present, three agreements are in place that provide assistance to develop alternative energy resources and to strengthen and promote the mineral industry in Nova Scotia.

The Canada-Nova Scotia Oil Substitution and Conservation Agreement continues in force and provides the resources for developing alternative energy resources through alternate energy sources such as biomass. In May 1986, a new two-year, $6.7 million Memorandum of Understanding on Conservation and Alternate Energy provides additional funding for alternate energy and conservation programs.

In the Mines and Minerals Branch, the Canada-Nova Scotia Mineral Development Agreement (CNSMDA) continues in force until March 1989. This five-year agreement, signed in June 1984, is valued at $26.9 million. Through its five programs — geoscience, mineral development, mineral research and technology, mineral investment stimulation and public information — the agreement is designed to strengthen and promote the mineral industry in Nova Scotia.

Co-operative work on mineral resources investigations by the Geological Survey of Canada and the Department, through the CNSMDA, has stimulated the private sector's search for minerals in Nova Scotia and has resulted in a major expansion of mineral exploration and development. Approximately $20 million was spent for exploration and development, principally for gold, by the mineral industry during the 1986 calendar year. This expenditure represents a record amount for exploration and development activity in Nova Scotia, and a major increase from the $8 million spent in 1985. During the same time period the number of exploration licenses increased from 1,025 in 1985 to 1,306 in 1986, and the area held under exploration license increased from 522 000 ha in 1985 to 605 000 ha in 1986.

During 1986, the value of mineral production reached $388 million compared to $355 million in 1985. Departmental staff have provided technical advice to individuals, prospectors and exploration companies in assessing

mineral deposits, increasing mineral recovery and decreasing energy use. Nova Scotia's mineral production and the direct, indirect and induced economic benefits contributed substantially to the provincial economy.

Optimism for the future of the mineral resources sector continues. Ten mining development projects in gold, industrial minerals and coal were underway during the 1986-87 fiscal year. Underground gold development work continued at Seabright Resources Incorporated 's Beaver Dam and Forest Hill projects and at Coxheath Gold Holdings Ltd.'s Tangier Project. Fundy Gypsum Company Ltd. and Domtar Construction Materials tested potential deposits with diamond drilling in Hants County. Georgia Pacific Corporation continued development drilling at Sugar Camp Lake, Inverness County, in preparation for gypsum production. Sandstone dimension stone resources were developed at Hardwood Hill, Pictou County, by B. MacKenzie. The Cape Breton Development Corporation (CBDC) drove the main access slope at the Phalen Colliery and a second slope at the Donkin-Morien Development. Pioneer Coal Company continued site development and core drilling on the Gardiner Seam at their Reserve Mines location in Cape Breton County. Suncor Incorporated continued their detailed studies of the New Glasgow coal project. In February 1987, Placer Development Ltd. assumed a 100 per cent option of the project for a period of five months.

Through the Mineral Research and Technology Program of the CNSMDA, the Department was able to assist the Mining Engineering Department at the Technical University of Nova Scotia (TUNS) to acquire new mineral processing equipment and rock mechanics testing equipment. The new equipment will allow TUNS to provide a high level of instruction in mining engineering as well as a broader range of consulting services to the mineral industry.

Geological and mining engineering students in Nova Scotia universities, colleges and schools received practical training through summer employment with the Department. The expanded field and office work created by the many CNSMDA projects gave employment to 40 students.

The Department continued to monitor petroleum and natural gas exploration work onshore and offshore, issues related to offshore resources, natural gas marketing and pricing policies, and Canadian and United States regulatory issues. On August 26, 1986, Nova Scotia signed the Canada-Nova Scotia Offshore Petroleum Resources Accord. The accord replaces the Canada-Nova Scotia Agreement on Offshore Resources Management and Revenue Sharing, and fosters a continued spirit of co-operation and agreement in offshore petroleum resource development.

Four new exploration agreements were signed with three companies for offshore petroleum exploration. At the end of the fiscal year, 871 000 ha were under active exploration license. Of the five exploration wells drilled, two encountered natural gas (Glenelg N-49 and Thebaud C-74) and one a significant amount of oil (Panuke B-90).

A number of programs have been developed by the Department, some with assistance from federal-provincial energy conservation agreements, to conserve energy in keeping with the Government of Nova Scotia's long-term commitment to energy self-sufficiency. During the year, 348 small businesses and government offices received energy audits to assist them in developing energy alternatives and conservation. The progress of energy conservation is represented by the decrease in refined petroleum products use from 5.3 million cubic metres in 1978 to 3.6 million cubic metres in 1986. During the fiscal year, petroleum accounted for 60.1 per cent of primary energy consumption, down from 62.5 per cent in 1985-86.

The Department funded research for the use of coal-water fuel (carbogel), coal gasification and coal liquefaction as alternate uses of coal. A new project, the potential of reclaiming coal from the Springhill coalfield dumps, was begun during the year. The work of the Department strengthens the knowledge of coal resources and potential uses for coal in the province. The Deputy Minister continues as Chairman of the Committee on Atlantic Coal, a group that promotes research and development for coal mining and utilization in the region.

In May 1986, the Department published a 20 year energy plan. It outlines the broad energy options available to the province for the period, as well as specific initiatives for the medium term.

During the year, Dr. John A. Garnett resigned as Assistant Deputy Minister, Mines and Minerals. The position was filled by the appointment of Dr. Richard Potter.

Working with the highly motivated and professional staff of the Department is a pleasure. Their work, achievements and publications are described in the following pages. I wish to thank the Minister of Mines and Energy, the Honourable Joel R. Matheson, Q.C., for his advice and assistance durir g the year.

Nova Scotia is well-endowed with mineral and energy resources. The steady production growth of industrial minerals, coal, aggregates and tin, along with major gold development projects, has encouraged the exploration and mining sectors and greatly aided the provincial economy. Nova Scotia is a good location for the development of energy and mineral related projects because of

its varied geology, strong workforce, geographical location and deep-water ports, and history of mineral and energy development.

ORGANIZATION AND PERSONNEL OF THE DEPARTMENT

ORGANIZATION

The Department of Mines and Energy is organized into six divisions. Three of these divisions — Mineral Resources, Mineral Development and Mining Engineering — are grouped together in the Mines and Minerals Branch under an Assistant Deputy Minister (ADM). The Energy Resources and Energy Management Divisions form the Energy Branch, also under the direction of an Assistant Deputy Minister. The two ADMs and the Director of the Administration Division report to the Deputy Minister. The organization of the Department as of 31 March, 1987, is shown in Figure 1.

RESPONSIBILITIES

Mineral Resources Division: responsible for the assessment of the province's mineral potential:

- Investigates the geology and documents mineral occurrences of the province through its own scientific programs and through analyses of private sector exploration activities
- Provides nontechnical information through maps, brochures, pamphlets and talks, about the geology and mineral resources, exploration and mining in Nova Scotia.

Mining Engineering Division: responsible for ensuring that Nova Scotia mines are developed according to current safety, environmental and mining practices and regulations:

- Conducts engineering studies
- Approves mining plans
- Administers departmental diamond drilling operations.

Mineral Development Division: responsible for issues involving the exploration and utilization of the province's mineral resources:

- Maintains a mineral and petroleum rights registry
- Assists development of mineral resources
- Operates a technical publications library in Halifax and Stellarton
- Maintains a core library and repository in Stellarton
- Monitors all private sector exploration work.

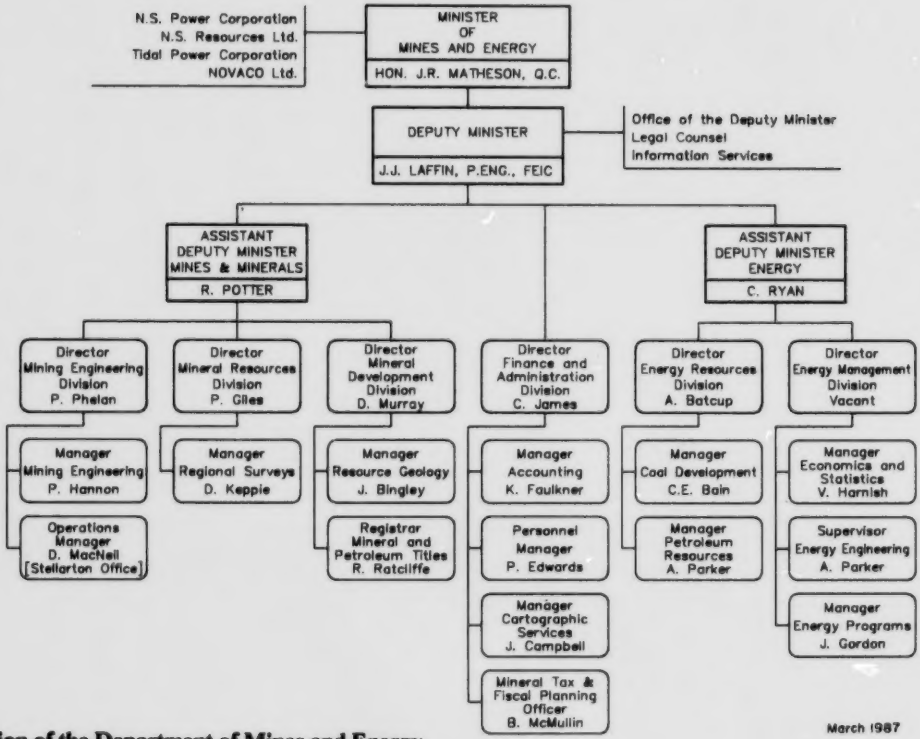
N.S. Power Corporation
N.S. Resources Ltd.
Tidal Power Corporation
NOVACO Ltd.
MINISTER OF MINES AND ENERGY
HON. J.R. MATHESON, Q.C.
DEPUTY MINISTER
J.J. LAFFIN, P.ENG., FEIC
Office of the Deputy Minister
Legal Counsel
Information Services
ASSISTANT DEPUTY MINISTER MINES & MINERALS
R. POTTER
ASSISTANT DEPUTY MINISTER ENERGY
C. RYAN
Director Mining Engineering Division P. Phelan
Director Mineral Resources Division P. Giles
Director Mineral Development Division D. Murray
Director Finance and Administration Division C. James
Director Energy Resources Division A. Batcup
Director Energy Management Division Vacant
Manager Mining Engineering P. Hannon
Operations Manager D. MacNeil [Stellarton Office]
Manager Regional Surveys D. Keppie
Manager Resource Geology J. Bingley
Registrar Mineral and Petroleum Titles R. Ratcliffe
Manager Accounting K. Faulkner
Personnel Manager P. Edwards
Manager Cartographic Services J. Campbell
Mineral Tax & Fiscal Planning Officer B. McMullin
Manager Coal Development C.E. Bain
Manager Petroleum Resources A. Parker
Manager Economics and Statistics V. Harnish
Supervisor Energy Engineering A. Parker
Manager Energy Programs J. Gordon
March 1987

FIGURE 1. Organization of the Department of Mines and Energy.

Energy Resources Division: responsible for the development of the province's indigenous energy resources; peat, coal, petroleum and natural gas:

- Monitors and regulates all petroleum exploration and development
- Undertakes coal and peat exploration programs
- Promotes energy resource development.

Energy Management Division: responsible for issues involving the supply of energy from outside the province, and the demand for and utilization of energy within the province:

- Develops economic analyses and statistics on energy matters
- Provides engineering services related to energy use
- Develops and administers energy conservation programs
- Provides public information about energy.

Administration Division: responsible for providing financial and other support services to the divisions of the Department:

- Provides accounting, mineral taxation, legal and personnel services
- Administers coal mine/miner financial aid programs
- Provides cartographic and photographic services
- Provides accounting services for Novaco Ltd.

PERSONNEL AND OFFICES

The Department has 162 employees, most of whom are employed in Halifax and Stellarton. Local offices are maintained in Glace Bay and Springhill.

Halifax

Founders Square, 1701 Hollis Street

Mines and Minerals Branch	424-5346
Mining Engineering Division	424-5764
Mineral Development Division	424-4162
Energy Branch	424-5351
Energy Resources Division	424-5933
Energy Management Division	424-5019
Administration Division	424-4629

Brewery Complex, 1496 Lower Water Street

Mineral Resources Division	424-4700

Stellarton

32 Bridge Avenue

Mineral Development Division 752-8430
(resource geology, exploration monitoring, core library)
Energy Resources Division
(coal exploration)
Engineering Division
(drilling, maintenance work)

MINES AND MINERALS BRANCH

R. R. Potter, PhD
Assistant Deputy Minister

The mineral resources of Nova Scotia and the mines that produce them are an important part of the provincial economy. These mining activities provide direct employment for more than 5,800 people. The development and well-being of the province's mineral resources sector is an essential part of the work of the Mines and Minerals Branch of the Department.

The Branch has a mandate to promote the understanding of the mineral resources and geology of the province; the exploration, development and efficient production of mineral deposits; and the maintenance of safe and environmentally acceptable mining practices.

Three divisions report to the Assistant Deputy Minister for Mines and Minerals. The Mineral Resources Division explores, assesses and publicizes the province's mineral wealth. The Mining Engineering Division ensures that mines in Nova Scotia are developed according to current safety, environmental and mining practices. The Mineral Development Division promotes the exploration and utilization of the province's mineral resources.

MINERAL RESOURCES DIVISION

P. S. Giles, PhD, Director

INTRODUCTION

The mandate of the Mineral Resources Division is to provide the Government of Nova Scotia, members of the mineral exploration community and the public with timely and objective descriptions and assessments of the mineral resources and geology of the province.

The orderly development of Nova Scotia's mineral resources requires a thorough knowledge of the geology of the province. The thirty geologists of the Division are providing this knowledge through directed research. They are:

- determining the mineral potential of known deposits
- searching for indications of new deposits through regional geochemical sampling and geological mapping
- publicizing the results of investigations by oral presentations and written papers in scientific journals, NSDME publications and "popular" brochures and booklets.

ACTIVITIES

Geological investigations in progress include regional bedrock mapping, mineral deposit studies, geochemical surveys, a study of Quaternary glacial deposits and their geochemistry, and regional assessment of the role of plate tectonics in mineral deposit genesis. All of these projects are completely or partially funded by the Canada-Nova Scotia Mineral Development Agreement (CNSMDA).

The investigations of the geology and mineral resources of the province have been greatly aided by the implementations of the CNSMDA. This five-year agreement, which ends in March 1989, will provide $26.9 million to develop a parallel, co-ordinated approach by both governments in five areas: geoscience, mineral development, mineral research and technology firm specifics and public information.

In addition, the Division has undertaken a program entitled the Education and Public Awareness Program, to bring to the public an appreciation of the province's mineral industry and its importance to Nova Scotia's continued economic development. Through this program, the Division emphasizes the importance of mining and mineral exploration to the province through a variety of educational programs designed for the general public. In addition, considerable emphasis is placed on the timely preparation of technical reports

and maps, which enable new data generated to be applied for a variety of purposes relevant to resource development.

Members of the Division were actively involved in the management of programs funded by the CNSMDA during the fiscal year. The director is a member of the Management Committee and co-chairperson of the Geoscience Subcommittee. The section manager is the provincial CNSMDA co-ordinator. The head of the Education and Public Awareness Program is co-chairperson of the Public Information Subcommittee.

Project Geology Section

J. Duncan Keppie, PhD, Manager

INTRODUCTION

The Project Geology Section provides detailed information about the rocks, minerals and mineral deposits in Nova Scotia. Members of the Section accomplish this purpose with applied geological research and regional and detailed geological mapping.

The Section provides support for the Mines and Minerals Branch Education and Public Awareness Program.

Funding from the Geoscience and Public Information programs of the CNSMDA supports most of the activities in the Section. Locations of the many projects operated by the Section are shown in Figure 2.

PROJECTS

Nine major projects were underway during the 1986/87 fiscal year. Twenty geologists from the Section worked in various locations across the province to unravel the geological development of Nova Scotia and to explore and map mineral deposits.

South Mountain Granite Project

The project goal is to explore and map the large body of granite stretching from Halifax to Yarmouth. This granite has several types of mineral deposits: the potential for hosting various East Kemptville-type deposits (tin-zinc-copper-silver) and other deposits (tungsten, gold, molybdenum, manganese, beryllium and rare earths).

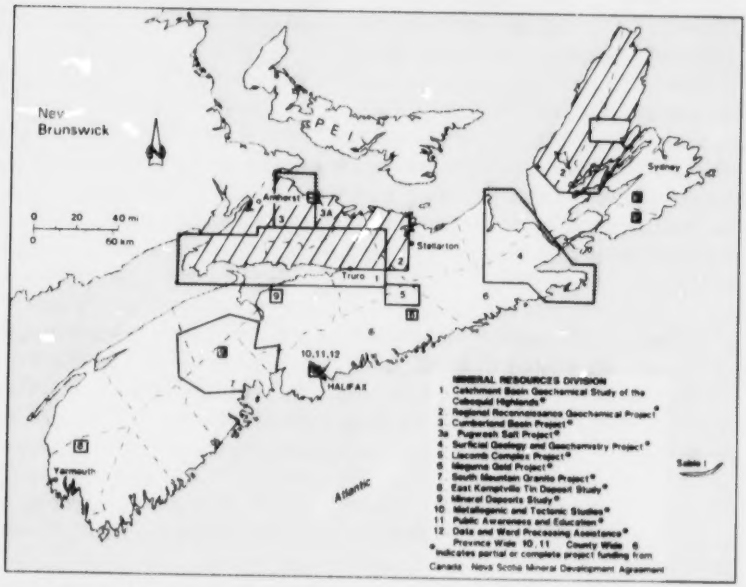

FIGURE 2. Locations of Mineral Resources Division projects.

The summer of 1986 was the second field season for this project. Work was divided between two teams of geologists mapping the bedrock and the loose surface deposits of the area west of Route 14, centred in northern Lunenburg County.

By studying and mapping the granite bedrock, geologists are able to assess the mineral potential of the granite. Regional and detailed mapping, laboratory work and chemical analyses of rocks define how the granite and its mineral deposits formed. This in turn leads to better ways of searching for mineral deposits in the granite.

The study of the loose glacial sand and gravel (till) deposits covering the granite forms the second part of the project. The purpose of this part is to study the glacial geology, assess the mineral potential of the covered granite bedrock through chemical analyses of the glacial till, and attempt to fit the glacial history into the regional history.

Results of work from both parts of the project are published in *Report of Activities* and *Program and Summaries* from the Annual Open House (see

Appendix A). Preliminary maps and reports on specific National Topographic Series (NTS) maps will be available shortly.

Geochemical Studies

The goal of this project is to produce an atlas on different scales that shows the distribution of selected elements in lake bottom sediments, stream sites, and soils and rocks across the province. Such an atlas provides a great incentive for exploration companies to continue looking for mineral deposits in Nova Scotia.

During 1986, summer work was concentrated on collecting water samples and stream silt samples from all across northern Nova Scotia and most of northern Cape Breton (Fig. 2). More than 1,300 localities were sampled. Data from the chemical analyses of the water and silt samples will support the completion of a geochemical atlas of the province.

Regional studies, such as these, allow mineral exploration people to concentrate their resources and effort more efficiently. Instead of broadly looking for minerals, they can use the regional geochemical data to focus their exploration work for certain minerals in specific areas of the province.

Cumberland Basin Project

The Cumberland Basin is a large area of sedimentary rocks stretching from Springhill area through Oxford to Tatamagouche (in Cumberland, Colchester and Pictou Counties.) The purpose of the work is to provide an understanding of the rock succession, their ancient environments and their mineral resources. The region is known to have reserves of salt and coal and occurrences of copper, lead, zinc, uranium, vanadium, gold and silver. The province's two salt mines are located in this basin. The salt in these deposits and others has potential for potash.

The Canadian Salt Company mine at Pugwash is part of a detailed study of salt deposits and related minerals occurrences. A geologist is mapping the salt deposit underground to understand how this deposit formed. The results of this work will allow the company to mine the salt more economically by knowing the predicted location of high- and low-grade salt reserves. It provides a rare opportunity to understand the formation and internal structure of a salt dome. This will give the department a better understanding of salt domes in the province and their potential for salt and potash deposits, and for petroleum storage and other uses.

Mineral Deposits Project

Nova Scotia has a variety of mineral deposits in complex geological environments. Some of these mineral deposits, and potential areas for them, are being studied in the South Mountain Granite Project and Cumberland Basin Project. Other mineral deposits are also being investigated through this project.

This project focuses on base metals (copper, lead, zinc and related gold and silver) in many different areas of the province. The purpose is to understand how certain deposits formed (for example in Walton, Hants County, and Stirling, Richmond County) and how others, not yet discovered, may be defined. It is a co-operative project involving geologists from the Geological Survey of Canada and Dalhousie University, as well as from the Division.

Another part of the project is the study of mineral deposits and occurrences associated with the South Mountain Granite. Northeast of New Ross, Lunenburg County, the Department drilled several exploration holes to test the mineralization at the Dean and Chapter Manganese Mine. Several mineralized zones were discovered as deep as 300 m (1000 ft.) along faults or shear zones.

Metallic Minerals — Structural Features Project

This project, known technically as the Metallotectonic Map Project, is designed to stimulate exploration for known and suspected occurrences of minerals in the province. The end product will be a map and memoir showing the important structural features of Nova Scotia (folds and folds) and their association with mineral occurrences. The importance of this work is that it becomes a tool in assessing and predicting the province's mineral occurrences and mineral potential.

During the 1986 field season, work centred on the folds, faults, igneous intrusions and mineral occurrences in eastern and northern Nova Scotia.

Liscomb Complex Project

As part of the geological work funded by the CNSMDA, all granite bodies in southern Nova Scotia will be investigated by the Geological Survey of Canada and the Department. One of these granites is the Liscomb Complex located on the northwestern edge of the Liscomb Game Sanctuary, Halifax County.

Field work during the summer of 1986 has indicated that the majority of rock is not granite in this area. Seven small, distinct, granite intrusions were defined; but of greater interest has been the dark-coloured igneous rocks (gabbros), breccia pipes and metamorphic rocks (gneisses). The study of this

rock suite will allow geologists to understand more clearly the way in which the deep crust and mantle influence rocks and mineral occurrences near the surface.

Meguma Gold Project

The gold-bearing rocks of the Meguma Group are found across southern Nova Scotia from Canso to Yarmouth. Historically, this area supported mining in 64 gold districts from 1861 to 1940. Geologists working on this project are re-examining some of these former gold-producing areas to test new ideas for stimulating gold exploration.

Field work during the 1986 summer was directed toward comparing and contrasting the styles of gold mineralization at 30 gold districts on the Eastern Shore region of Nova Scotia. The purpose of the investigation was to find a unifying reason for gold mineralization. Results of the study show that most of the rocks near or at the gold deposits are affected by large alteration zones. Another common feature is the wide variety and intricate and composite nature of the quartz veins. Gold mineralization is generally found in the younger, more massive, quartz veins. Alteration zones can give an indication for exploration in areas potentially rich in gold.

In another part of the project work, geologists mapped and collected samples at the underground gold development projects of several companies. Underground work by Seabright Resources Inc. (Beaver Dam, Halifax County; Forest Hill, Guysborough County), SCOMINEX (Cochrane Hill, Guysborough County) and Coxheath Gold Holdings Ltd. (Tangier, Halifax County) provided three dimensional exposures of quartz veins with the attendant alteration zones and gold mineralization.

Work on this project has assisted exploration and mining companies to understand gold mineralization in Nova Scotia. Detailed results are presented in the Open House and Review of Activities publication *"Program and Summaries"* for 1986 and the *Mines and Minerals Branch Review of Activities for 1986*. At the Prospectors and Developers Association of Canada (PDAC) Annual meeting, geologists from this project presented a paper entitled "Meguma Gold in Nova Scotia: The Best Kept Secret in the Canadian Mining Industry." The display at PDAC highlighted gold research and exploration by geologists in the Division.

Glacial Deposits Project

Research work on surficial deposits is designed to describe the glacial history of Nova Scotia and the geochemistry of the glacial deposits. By studying how glaciers have moved, the materials they have transported and the chemistry of

the deposits, exploration companies may be able to locate buried mineral deposits.

Field work during 1986 was centred in Pictou, Antigonish and Guysborough Counties. The project was jointly funded by the Geological Survey of Canada (Energy, Mines and Resources Canada) and the Department through the CNSMDA.

The principal purpose of the work was to define and describe the different glacial movements and their deposits in northern Nova Scotia. Additionally, samples of the glacial deposits were taken for chemical analysis. By determining the location of concentrations of elements through chemical analyses and knowing the direction from which the glacier moved, it is possible to determine and locate buried mineral deposits. Thus the study of glacial deposits and the movement of glaciers can assist exploration companies in their search for minerals.

Glacial deposits of sand and gravel are the principal reservoir of water for many people in the province and the source of large volumes of sand and gravel (aggregates) used in construction. Work on this project has assisted many government agencies in defining potential land use as well as outlining water and aggregate resources.

Most of the province has now been mapped at 1:100,000 or 1:50,000 scale. Cape Breton Island is the next region for study.

Data and Word Processing Assistance Project

This project is assisting the Mines and Minerals Branch to acquire more convenient and timely access to electronic data processing facilities.

During the 1986/87 fiscal year, 12 micro-computers with peripherals and software were purchased and introduced for use within the Division and the Branch. This represents 50 per cent completion of Phase I of three additive phases. In the long range planning, the other two phases will provide for installation of and networking with a central mini-computer.

Most of the computers now in use are supporting multi-task users including word processing, database and spread sheet analysis. Staff members in the Mineral Resources Division and other divisions have the benefit of tutorial sessions for learning the use of the hardware and software as well as regular user meetings to share experience gained through various applications. The continuing need for exposing as many departmental staff to computers is a major component of the on-going training and information strategy.

EDUCATION AND PUBLIC AWARENESS PROGRAM

The Education and Public Awareness Program produces and promotes educational information about the geology, mineral resources and mining history of the province and about the geological projects of the Mines and Minerals Branch. The Prospecting Course, technical and non-technical displays, the annual Open House and publications are ways of meeting this goal. Geologists in the program developed and implemented a communications plan for the Public Information Program of the CNSMDA. The objectives of the program are similar to those of the Division's Education and Public Awareness Program. Additionally, the programs and projects of the CNSMDA are defined, described and publicized.

During the third year of the CNSMDA, the staff of the Education and Public Awareness Program are continuing to develop educational projects to further the goals of the CNSMDA. Displays feature information about the CNSMDA and describe some of the projects. Special publications were prepared and printed to describe some of the programs and their benefits to the mineral industry.

Prospecting Course

During the fiscal year 1986/87, the course entitled "Prospecting and Geology in Nova Scotia" was offered in Halifax. It marked the eighth time the course has been offered. To date, more than 170 people have taken the course.

The course covers identification of rocks and minerals, use of maps and air photos, preparation of geological maps, prospecting techniques and the role of the Department in exploration. The Chamber of Mineral Resources of Nova Scotia, the Department of Mines and Energy and Dalhousie University sponsor the course.

Displays

The Education and Public Awareness Program is responsible for displays describing mineral resources and mining in the province, the projects of the Mines and Minerals Branch. Displays at technical meetings and various exhibitions across Nova Scotia during the fiscal year presented information about previous gold mining, mineral exploration and development, the province's mineral resources and the programs of the CNSMDA.

During the summer of 1986, displays were prepared and shown in eight shopping centres in different parts of the province. In addition, major displays were prepared for the Nova Scotia Forestry Exhibition (Windsor), Mining

Society of Nova Scotia (Ingonish), Rockhound Roundup (Parrsboro), Canadian Institute of Mining and Metallurgy (CIMM) District 1 Meeting (Halifax), and the Prospectors and Developers Association (Toronto). An estimated total of 15,000 people saw these displays.

At the annual meeting of the Prospectors and Developers Association, two displays were established. One introduced the Department and the mineral potential of the province. The second display focused on gold mineralization.

Open House

Each year the Mines and Minerals Branch hosts the Open House and Review of Activities. The event was held November 19-20, 1986 at the Halifax Sheraton in conjunction with the CIMM District 1 Meeting. More than 320 people attended the function to hear talks and see displays by geologists from the Department, the Geological Survey of Canada and Nova Scotia universities.

Educational Work

Geologists in the Education and Public Awareness Program work with the Nova Scotia Museum and the Department of Education to prepare educational materials for school use, and to develop and present walking tours and public lectures. A loan kit from the Nova Scotia Museum, "The Mining Kit", is in preparation for support of the grade eight unit Science in Mining.

Three brochures have been prepared to describe staking claims in Nova Scotia, the rights of land owners and how to find goods and services for the exploration industry. Two additional brochures describe self-guiding walking tours of downtown Halifax and Point Pleasant.

EDITING AND PUBLISHING SERVICES

Detailed technical publications are the principal means of communicating information about the geology and mineral resources of Nova Scotia. The technical reports are published either as part of the Department's publications series or in scientific journals. The Education and Public Awareness Program produces brochures and pamphlets for the general public. All of these publishing activities are supported by a senior editor, an editor and two word processing operators.

The division staff present numerous talks and lectures at technical displays, universities and community groups.

Technical summaries for each of the projects appear in the annual *Mines and Minerals Branch Report of Activities*. Brief descriptions of each project appear in the annual Open House and Review of Activities publication *Program and Summaries*. A list of publications by the geologists of the Section, as well as other departmental publications, appears in Appendix A.

MINING ENGINEERING DIVISION

P. W. Phelan, PEng, Director

INTRODUCTION

The Mining Engineering Division is responsible for the administration and regulation of the mining industry in the province on behalf of the Department of Mines and Energy, and for providing a diamond drilling service to the Mineral Resources, Mineral Development and Energy Resources Divisions of the Department. The Division is also responsible for maintaining the equipment and facilities necessary for the drilling activities and for providing maintenance services for departmental vehicles and equipment.

SIGNIFICANT EVENTS IN 1986-87

One new surface coal operation began production during the year. It is operated by Nova Construction under sublease from the Cape Breton Development Corporation (CBDC), and provides 100 000 t/year of washed coal for the domestic and thermal markets. Two barite mining leases (Dresser Magcobar at Walton, Hants County, and Scotsville Mineral Resources at Scotsville, Inverness County) lapsed because of weak markets and liquidity problems.

Rio Algom turned the East Kemptville tin project over to the consortium of banks that financed the venture following the collapse of the International Tin Council. The bank consortium have formed a company, "East Kemptville Tin Corporation" and continue to operate the mine.

This year, four gold projects were evaluated by underground bulk sampling. Seabright Resources went underground via a shaft for two 4 000 t (4,400 ton) bulk samples at Forest Hill, Guysborough County. This company also went underground at Beaver Dam, Halifax County via a ramp for a 4 000 t (4,400 ton) sample. Coxheath Gold Holdings Inc. went underground via a ramp for a 4 000 t (4,400 ton) bulk sample at Tangier, Halifax County. At Cochrane Hill, Halifax County, a 4 000 t (4,400 ton) underground bulk sampling program was carried out by SCOMINEX. The inclined mine shaft located on the Cochrane Hill property was rehabilitated and used for the bulk sample work.

The Division's Drilling and Maintenance Section drilled 61 holes for a total footage of 5853 m (19,203 ft.)

Three CNSMDA projects for a total expenditure of $265,000 were administered by the Division this year. The pilot plant located in the Mineral Engineering Centre at TUNS received $163,000 for the purchase of new processing equipment. The Mining and Metallurgical Engineering Rock

Mechanics Lab at TUNS received $67,000 for new equipment. The third CNSMDA project was for a report entitled "Environmental Implications of Requirements to Mineral Development in Nova Scotia." The total cost of this project was $35,000.

Members of the Division manage the Mineral Research and Technology Program of the CNSMDA. The manager of the Mining Engineering Section is Co-Chairperson of the Program Subcommittee. He and others supervise and offer advice to various projects under the CNSMDA.

Mining Engineering Section

P. J. Hannon, PEng, Manager

The Mining Engineering Section is responsible for ensuring that the province's mineral and energy resources are utilized to their optimum, and that mining operations are conducted in a safe, efficient and environmentally acceptable manner.

This includes reviewing proposals from industry for new mining projects or modifications to existing mines, and making recommendations for the issuing of mining leases and permits. The Section also provides technical advice and assistance to industry and government on mining problems, and conducts economic and feasibility studies for new mineral projects.

Drill and Mechanical Section

D. MacNeil, Manager

The Drill and Mechanical Section is responsible for operating the Department's diamond drills and maintaining all mechanical equipment and vehicles.

A series of eight 150 ft. (46 m) holes were drilled for SCOMINEX at Cochrane Hill. All other drilling in 1986 was conducted for various Divisions within the Department. No drilling was done for other government departments.

The amount of departmental drilling completed during the last several years is shown in Table 1. Details of fiscal year 1986/87 drilling are given in Table 2. Further details about individual holes are given in the annual publication *Drill Logs of Government Core Drills.*

TABLE 1. Annual drilling statistics.

Fiscal Year	Number of Holes	Amount Drilled	
		Feet	Metres
1982-83	84	22,189	6 763
1983-84	76	19,862	6 054
1984-85	27	17,434	5 314
1985-86	14	20,538	6 260
1986-87	61	19,203	5 853

TABLE 2. Departmental drill holes completed during fiscal year 1986/87.

Site Name	Map Reference	D D H Designation	Grid Designation or Co-ordinates: Northing	Easting	Drilled Feet	Metres	Finish Date
Hardwood Hills	11-E-10-C	McK-86-1	5058368	200819	100.0	30.5	
		McK-86-2	5058336	200820	100.0	30.5	
		McK-86-3	5058523	200853	100.0	30.5	26-11-86
Sawmills/Lyons Bk.	11-E-10-C	SMB-86-4	5058770	203393	87.0	26.5	
		SMB-86-5	5058830	203370	45.0	13.7	
		SMB-86-6	5058815	203385	58.5	17.8	30-07-86
Eight Mile Brook	11E-E-10-B	EMB-86-2	5047004	196914	117.0	35.7	
		EMB-86-3	5047031	196924	137.0	41.8	
		EMB-86-4	—	—	87.0	26.5	
		EMB-86-5	—	—	87.0	26.5	
		EMB-86-6	—	—	116.0	35.4	
		EMB-86-7	—	—	65.0	19.8	06-08-86
Caribou Road	11-E-10-D	CRP-86-1	5061742	211968	157.0	47.9	
		CRP-86-2	5061890	211903	157.0	47.9	
		CRP-86-3	5061700	212009	157.0	47.9	08-04-86
Amherst	21-H-16-A	AMH-86-1	—	—	157.0	47.9	
		AMH-86-2	—	—	107.0	32.6	
		AMH-86-3	—	—	107.0	32.6	09-05-86
Wallace	11-E-14-B	WAL-86-1	—	—	122.0	37.2	
		WAL-86-2	—	—	97.0	29.6	
		WAL-86-3	—	—	107.0	32.6	
		WAL-86-4	—	—	157.0	47.9	
		WAL-86-5	—	—	257.0	78.3	

TABLE 2. Continued

Site Name	Map Reference	D D H Designation	Grid Designation or Co-ordinates: Northing	Easting	Drilled Feet	Metres	Finish Date
		WAL-86-6	—	—	177.0	53.9	
		WAL-86-7	—	—	177.0	53.9	
		WAL-86-8	—	—	177.0	53.9	30-10-86
Judique	11-F14-B	J-86-1	—	—	44.0	13.4	12-05-86
Lake Charlotte	11-D-15-B	LKCH-86-1	4959827	192520	903.0	275.2	24-10-86
The Falls	11-E-11-C	TF-86-1	5056989	402031	2577.0	785.5	17-09-86
Sinclair Lake	11-D-01-A	SI-86-1	4992432	264200	1494.0	455.4	06-01-87
Fraser's Mountain	11-E-10-A	P57	5052124	218035	483.0	147.2	24-04-86
Lewis Road	11-E-10-D	P58	5052124	219148	2774.6	845.7	20-05-86
Salmon River	11-F-16-B	Y-86-401	10+70	40+40W	195.0	59.4	
Lead Deposit		Y-86-402	12+72	40+60W	187.0	57.0	
		Y-86-403	11+70	37+10W	207.0	63.1	
		Y-86-404	10+80	39+10W	197.0	60.0	
		Y-86-405	11+70	42+10W	157.0	47.9	
		Y-86-406	12+80	44+15W	147.0	44.8	
		Y-86-407	13+70	44+50W	97.0	29.6	
		Y-86-408	13+90	42+15W	164.0	50.0	
		Y-86-409	14+90	46+90W	126.0	38.4	
		Y-86-410	13+00	47+10W	137.0	41.8	
		Y-86-411	10+90	47+00W	101.0	30.8	
		Y-86-412	11+00	44+05W	173.0	52.7	04-07-86
		Y-86-402A	12+65	40+88W	192.0	58.5	
		Y-86-404A	10+85	39+00W	156.0	47.5	

TABLE 2. Continued

Site Name	Map Reference	D D H Designation	Grid Designation or Co-ordinates: Northing	Easting	Drilled Feet	Metres	Finish Date
		Y-86-406A	12+84	44+10W	235.4	71.7	
		Y-86-408A	14+03	42+00W	161.0	49.1	
		Y-86-409A	14+72	47+16W	128.0	39.0	
		Y-86-410A	13+02	47+06W	128.0	39.0	31-10-86
Meadows Road	11-K-01-B	M-86-1	—	—	411.0	125.3	
		M-86-2	—	—	367.0	111.9	
		M-86-3	—	—	277.0	84.4	
		M-86-4	—	—	277.0	84.4	
		M-86-5	—	—	127.0	38.7	
		M-86-6	—	—	147.0	44.8	
		M-86-7	—	—	277.0	84.4	
		M-86-8	—	—	221.0	67.4	11-09-86
New Campbellton	11-K-08-A	NC-87-1	—	—	1774.0	540.7	30-3-87
Big Tom Wallace Lake	21-A-05-D	MRR-D-1	4928027	540283	3873.0	1180.5	31-3-87
			Total for Year		22127.5	6744.5	

MINERAL DEVELOPMENT DIVISION

D. A. Murray, MSc, Director

The Mineral Development Division is divided into two sections, the Resource Geology Section and the Mineral and Petroleum Titles Section. The responsibilities of the Division lie in the orderly development and promotion of the province's mineral resources. Included in these responsibilities are mineral resource regulations, mineral titles policies and assistance in the promotion and development of all minerals. It also maintains geological information through the departmental libraries and drill core library. The Division monitors mineral production and mineral exploration activity in the province and provides liaison among mineral producers, the exploration research establishments, landowners and government agencies. The division also collects and compiles mineral production and exploration statistics.

Projects carried out under the Canada/Nova Scotia Mineral Development Agreement (CNSMDA) identify a number of new opportunities which will allow current operators to expand and new operators to get involved in the mineral industry. This agreement has also provided partial funding to the industry through the Mineral Investment Stimulation Program (MISP) for development projects. A new core library building will also be built under this agreement, which will upgrade and provide better facilities for core examination.

Mineral and Petroleum Titles Registry

R. Ratcliffe
Registrar of Mineral and Petroleum Titles

The Mineral and Petroleum Titles Registry is responsible for receiving applications for mineral and petroleum rights and for issuing and registering the licenses or leases. In addition, any documents affecting licenses, such as transfers of title, assignments of interest, option agreements, special licenses and exploration agreements, are registered by this office. The Registry also receives all statements of exploration expenditures and assessment reports that pertain to the renewal of licenses and leases. Maps showing the disposition of lands under license or lease are maintained and continually updated. These maps are available for a nominal charge. Applications for underground gas storage rights and treasure trove licenses are also processed through this office. Information concerning production and employment in Nova Scotia's mines and quarries is received and tabulated by the Registry and published annually by the Department.

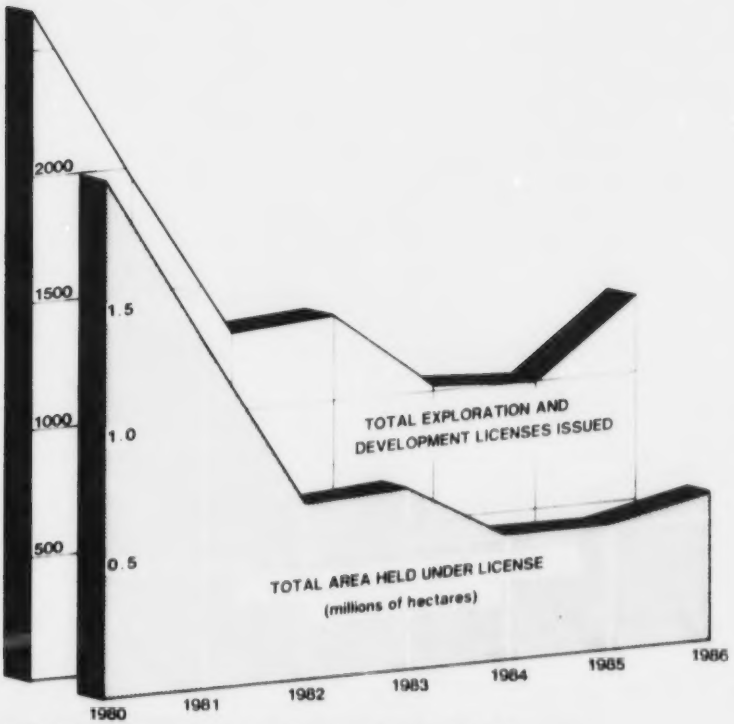

FIGURE 3. Trends in mineral exploration and development.

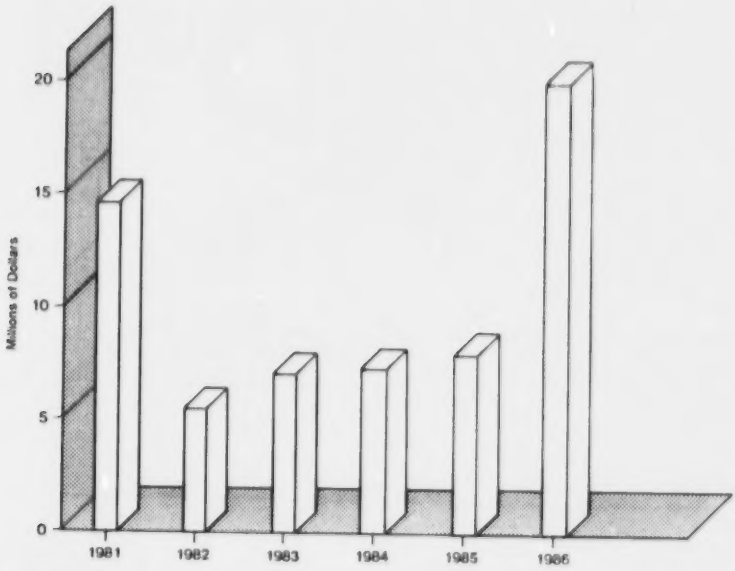

FIGURE 4. Trend in expenditures for mineral exploration.

A large number of inquiries from industry, the public and other government departments are answered each year. Most deal with procedures for obtaining licenses, information on past exploration and mining activities, statistical information on production for operating properties and general questions about licenses. The Registry is responsible for all fees, bonds and other monies due for licenses, leases, statutory work deposits, payments in lieu of work, the sale of claims reference maps and copies of legislation from the Halifax office library.

The Registry maintained a fairly high level of activity in 1986 (Table 3). In total, 1,306 exploration and development licenses (Fig. 3) were issued to 205 licensees for a total of 36,714 claims or 594 318 ha (1,468,560 acres). Fifty-one transfers were processed and 34 agreements received. During 1986, a total of $9,954,014 in assessment work was reported to have been conducted in the province (Table 3). Exploration expenditures have increased considerably from $8 million in 1985 to $20 million in 1986 (Fig. 4). In support of this reported work, 154 assessment reports were received in 1986. Registry staff participated in the review of the *Mineral Resources Act.*

The regulations under the *Petroleum Resources Act* were brought into force in October of 1985. As a result, three former petroleum licensees entered into

New Brunswick
N
P.E.I.
Sydney
Stellarton
HALIFAX
Atlantic
Sable I.
MINERAL DEVELOPMENT DIVISION
1 Aggregates Project*
2 Building Stone Project*
3 Gypsum and Anhydrite Project*
4 Diatomaceous Earth Project*
5 Various Commodities Project*
6 Fibers Project*
7 Gold Resource Project*
8 Core Library Project*
9 Drillholes and Mineral Occurrences Database*
10 Mineral Land Use Policy Development Project*
11 Mineral Resources Promotion Project*
12 Exploration Monitoring/Regional Office
County Wide 1 2 3 4 5 7
Province Wide 4 5 6 7 9 10
* indicates partial or complete project funding from Canada - Nova Scotia Mineral Development Agreement

FIGURE 5. Locations of Mineral Development Division projects.

negotiations for exploration agreements. One application from a new interest was received. In total, four exploration agreements were granted in 1986 to three companies for 3,996,026 acres (1 617 170 ha).

During the summer of 1986, a student from the Co-operative Education Program continued work on a computer program for the Registry. The program and the computer system will be in use during 1987.

TABLE 3. Mineral exploration trends in Nova Scotia.

		1979	1980	1981	1982	1983	1984	1985	1986
SUMMARY (onshore)									
Value of Reported Assessment Work		$4,700,000	$7,564,000	$ 8,441,270	$4,100,000	$4,200,000	$2,625,666	$2,389,351	$ 9,954,014
Exploration Expenditure		—	—	$14,608,000	$5,553,000	$7,000,000	$7,300,000	$8,000,000	$20,000,000[1]
Total Licences Issued		1,841	2,559	1,952	1,298	1,350	1,039	1,025	1,306
CLAIMS RECORDED ONSHORE[2]									
Base Metal	claims	40,497	88,703	68,863	39,626	40,630	26,627	27,809	36,714
	acres	1,619,880	3,548,120	2,754,520	1,585,040	1,585,040	1,065,080	1,112,360	1,468,560
	hectares	655 556	1 435 904	1 114 739	648 871	657 709	431 032	450 166	594 318
Uranium	claims	30,920	25,483	6,225	—[3]	—[3]	—[3]	—	—[3]
	acres	1,236,800	1,019,320	249,000	—	—	—	—	—
	hectares	500 526	412 513	100 769	—	—	—	—	—
Salt, Potash	claims	2,256	13,505	5,225	1,065	505	1,257	830	192
	acres	90,240	540,200	209,000	42,600	20,200	50,280	33,200	7,680
	hectares	36 519	218 616	84 581	17 240	8 175	20 348	13 436	3 108
Coal	claims	—	—	4,880	3,072	4,565	3,584	3,584	482
	acres	—	—	195,199	122,880	182,599	143,360	143,360	19,280
	hectares	—	—	78 996	49 729	73 897	58 017	58 017	7 803
Number of Mineral Assessment Reports		126	140	150	124	188	127	108	154
Total Areas Held	acres	2,946,920	5,107,640	3,407,719	1,750,520	1,787,839	1,258,720	1,288,920	1,495,520
Under Licence	hectares	1 192 601	2 067 033	1 379 085	715 840	739 781	509 397	521 619	605 229

TABLE 3. Continued

PETROLEUM LICENCES ISSUED

Land Areas	licences	44	52	99	68	93	106[4]	—	3
	acres	3,456,875	4,284,909	6,230,046	5,419,952	8,048,306	8,567,791[4]	—	3,996,026
	hectares	1 398 978	1 734 079	2 521 265	2 193 424	3 257 104	3 467 338[4]	—	1 617 170
Submarine Areas	licences	147	151	172	168	—	—	—	—
	acres	31,221,055	31,589,070	34,786,199	33,965,867	—	—	—	—
	hectares	12 634 978	12 783 921	14 077 781	13 745 798	—	—	—	—

[1]estimate from Nova Scotia Department of Mines and Energy sources.
[2]claims are 40 acres or 16.2 ha each
[3]uranium exploration and mining moratorium in effect
[4]as of July 1, 1984

Resource Geology Section

J. M. Bingley, BSc, Manager

INTRODUCTION

The Resource Geology Section of the Mineral Development Division works with industry, educational institutions, other government agencies and the public to promote a strong mineral industry and to provide geological and geostatistical information and services. The personnel resource to perform these functions consists of geologists, biologists, planners, technicians, librarians and secretaries; sixteen of whom are situated in the Halifax office and eight in the Stellarton office. An additional 12 or more student assistants and casual employees are hired for the summer months and to provide peak-time assistance. The projects these professionals manage and their locations are shown in Fig. 5.

A geologist and a biologist were transferred from the Energy Resources Section to manage the "Aggregate" and "Diatomite" projects respectively. Additional geologists were hired to manage the "Fillers" and "Various Commodities" projects and a planner was brought on staff to assist on the "Land Use Policy Development Project." All of these positions are term appointments funded through the CNSMDA.

HALIFAX OFFICE ACTIVITIES

The Halifax staff of the Resource Geology Section is located on the second floor of the Joseph Howe Building, 1690 Hollis Street, together with the Registry of Mineral and Petroleum Titles and Cartography Sections.

Functions and services provided by the section in the Halifax office are:

- maintenance of the departmental library which consists of extensive geological, mining and energy related materials and is open to the public
- industrial minerals research (Building Stone, Diatomite, Fillers, Aggregates, Various Commodities and Gypsum/Anhydrite Projects) and assistance to industry
- compilation and publication of various mineral inventory type databases (GEOSCAN, drillholes, gold bibliography, mineral inventory, etc.)
- compilation of databases and maps for the Land Use Policy Development Project
- compilation of field data and information for the Gold Inventory Project.

INDUSTRIAL MINERAL PROJECTS

General improvements in the North American economy have had a favourable impact on industrial mineral activities in Nova Scotia, as evidenced by production increases for several commodities and new interest in many of the province's underdeveloped resources.

Financial support for various types of studies and work by division geologists is from the Mineral Development Program of the CNSMDA. The program allows the Department and Energy, Mines and Resources Canada to undertake many industrial mineral projects designed to promote resource development in Nova Scotia. Projects underway include commodity market studies, mineral technology projects and mineral resource evaluation projects.

Mineral Resource Projects

The objective of these studies is to create an awareness of the province's industrial mineral resources and to promote resource development and production diversification. Projects underway will:

- identify and promote the development of the building stone resources of the province
- document the gypsum and anhydrite resources of Nova Scotia
- map the aggregate resources in selected regions of the province
- evaluate the province's diatomite resource
- describe the filler and extender market and begin a market evaluation
- collect and evaluate an information database about many of the province's lesser known industrial minerals.

Aggregate Resource Project

Introduction. Aggregate is a key construction material and an important link in Nova Scotia's economy. In recent years, the industry has consistently ranked among the top mining activities in the province, placing second only to coal in terms of product value and employment. In 1986, 11.3 million t (12.4 million tons) of aggregate were produced with a market value of $51.4 million and employing 744 individuals. Because of its strong ties with construction, the impact of the industry is felt province-wide, thus increasing its value for employment in Nova Scotia.

Background. The importance of the industry to the province, in conjunction with the depletion of reserves and public concerns regarding the industry, underlines the need for identification and sound management of the resource. The Nova Scotia Department of Mines and Energy has been directly involved in an assessment of the resource since the mid-seventies. The result was the

implementation of an aggregate inventory program to evaluate the aggregate deposits in Nova Scotia. More recently, specific areas within the province were targeted for a more detailed assessment. These comprise studies of Pictou County, Cape Breton Island and southwestern Nova Scotia. Detailed information about aggregates has been published by the Department and is available in the departmental libraries.

Current Project. The northern Nova Scotia survey is the next phase in this resource evaluation project. The study encompasses Cumberland and Colchester counties (Fig. 5), both of which have problems with depleted supplies and poor quality aggregate. For example, no aggregate deposits are found near the Amherst area and many of the closest deposits are of poor quality. As a result, their aggregate needs must be met utilizing sources from well inside New Brunswick or in the region of the Cobequid Highlands, involving long haulage at additional expense to both the producer and consumer. Other areas in the counties which do have a supply of quality aggregate are facing loss of the resource because of the encroachment of urban development. Truro is an example where good aggregate is relatively abundant; however, urbanization is making much of the resource inaccessible. A large portion of the aggregate potential in northern Nova Scotia underlies marginally arable land, which is being utilized to produce crops such as blueberries. Because the value of the land as an agricultural base is usually perceived as being greater than that for aggregate, these areas are generally not economical for purchase and development by the aggregate producer. The result is that the deposits located under much of these croplands have been removed from potential use for the near future. As is typical in most regions, the better aggregate is being consumed first, thus contributing to selective resource depletion in some areas.

Objectives. The basic aim of the study is to define and evaluate the aggregate resource in Cumberland and Colchester counties. This comprises the delineation of all known granular deposits, the search for new deposits, the location of bedrock lithogies with potential as crushed stone aggregate materials, and the assessment of the quality of all materials examined.

Methods. The study was initiated in June 1986, and consists of four steps:

- preliminary study
- field investigation
- selective sampling program
- data assessment.

The preliminary phase of the project involved a literature review to examine and evaluate all information pertinent to Cumberland and Colchester counties. In preparation of the field investigation phase, aerial photographs were examined to outline potential deposits. The field investigation, still in progress,

is being conducted utilizing geological and topographic maps. All exposures are being mapped, with qualitative testing on the more promising materials being conducted. New sources of aggregate will be evaluated by trenching and seismic profiling.

The final phase of the project, to be conducted in the autumn of 1987, will be to assess the data which was gathered over the two field seasons. The results will be compiled and presented in a report and inclusive map(s).

Preliminary Results. Approximately 50 per cent of the necessary field mapping was accomplished during the 1986 field season. Preliminary results indicate that the aggregate deposits in the area are primarily glacio-fluvial and glacio-marine in origin. Furthermore, the quality of these granular deposits appears to improve near or on the Cobequid Highlands, reflecting a greater influence from this source area. Other deposits of interest include weathered conglomerate and weathered granite, both of which occur in a semi-consolidated state and can easily be excavated. Qualitative testing of these deposits will be conducted in the coming field season.

Building Stone Project

Nova Scotia produced building stone for a flourishing export and domestic market in the 1800's and early 1900's. As many as 75 sandstone quarries and 10 granite quarries produced stone for a total recorded production of 1.2 million t (1.1 million tons) in the period 1873 to 1973.

During the 1986-87 fiscal year, field investigations began to define sandstone and granite resources. The locations are shown on Figure 5.

Sandstone. To date, most of the abandoned sandstone quarries have been located and sampled. The following locations were selected for detailed work, including diamond drilling.

Wallace Quarry. The Wallace quarry in Wallace, Cumberland County, has produced three colours of stone in the past. The greatest volume of stone produced was a medium to dark olive green, fine- to medium-grained massive sandstone of Late Carboniferous age. The average thickness of the quarried unit was 12 m (40 feet). It overlies a fine- to medium-grained-blue-grey sandstone which has an average thickness of about 3 m (10 ft). A light olive green sandstone was also produced from small pockets on the northwestern and western side of the quarry. The Department completed a core drill program consisting of eight holes for 319 m (1,045 ft) on the east side of the quarry. The purpose was to locate additional reserves of sandstone. Between 5.8 and 8.2 m (19 and 27 ft) of massive fine- to medium-grained sandstone was intersected in

holes Wal-86-4 and 5 beneath 11.3 m (38 ft.) of overburden, sandstone and shale. Two units of blue-grey sandstone were intersected below the olive sandstone and a thin shale unit. Approximately 10 150 m^3 (360,000 $ft.^3$) of green sandstone and 32 800 m^3 (1.16×10^6 $ft.^3$) of blue-grey sandstone were outlined in this program, with the resource open to the north and east.

Amherst Quarry. This is one of the oldest quarries in northern Nova Scotia, and the pinkish red stone raised for building stone from this location is probably as well known as the olive green Wallace stone. The quarry is about 30 m (100 ft.) deep, 91 m (300 ft.) in diameter and presently filled with water.

Three holes were collared on the west side of the quarry for a total of 113 m (371 ft.). All holes intersected 18.3 to 21.9 m (60 to 72 ft.) of red fine- to medium-grained massive sandstone of the Pictou Group. The stone was overlain by 3.7 to 4.3 m (12 to 14 ft.) of overburden and underlain by 11.6 m (38 ft.) of red siltstone and/or mudstone. This drilling has outlined 27,300 m^3 (965,900 $ft.^3$) of sandstone and the resource is open in all directions.

Eight Mile Brook. A small quarry was operated by a gravestone manufacturer on Eight Mile Brook, Pictou County, at the beginning of this century. A fine-grained, massive, light grey sandstone of the Riversdale Group was quarried. Recently, the Department completed a drill program consisting of seven holes for 224 m (736 ft.) in April and June of 1986. The goal of the program was to locate the grey sandstone horizon on the north bank of the brook. Holes EMB-86-3, 4 and 5 intersected the grey sandstone at 5.2, 6.4 and 10.9 m (17, 21 and 36 ft.) deep respectively. The grey stone varies in thickness from 5.2 to 14.3 m (21 to 47 ft.) and is overlain by 4.5 to 5.2 m (15 to 17 ft.) of overburden and minor amounts of brown sandstone. Hole 7 intersected 4.6 m (15 ft.) of grey sandstone to the north east along strike. A deposit of 25 800 m^3 (910,000 $ft.^3$) of high quality grey sandstone was outlined by this program.

Sawmill Brook Quarry, Pictou County. This quarry produced a light olive green to tan sandstone for the export market in the period between 1850 and 1870. Stone from this quarry also was used in a number of stone buildings in Pictou County and in the city of Halifax. In order to assess the quantity and quality of stone remaining, the quarry was pumped out and mapped. A diamond drill program consisting of six holes for 192 m (631 ft.) was carried out between March and July, 1986.

The sandstone exposed in the quarry strikes NE and dips 25° to the SE. Two sandstone horizons were quarried, separated by 1.8 m (6 ft.) of shale for a total thickness of about 12 m (40 ft.). Due to the dip of the sandstone, it was not exposed on top of the stream bank where the drilling was carried out. However, a red-brown, fine- to medium-grained sandstone was intersected in holes SMB-

86-1, 4, 5 and 6. This stone may serve as a substitute for the Marys Point, New Brunswick brown sandstone which was used in many Halifax buildings. Only the top 3.0 to 3.6 m (10 to 12 ft.) of the red-brown sandstone is a suitable substitute for Marys Point stone. The overburden varies in thickness from 3.0 to 4.9m (10 to 16 ft.) in holes SMB-86-5 and 6. Approximately 3 900 m^3 (138,000 $ft.^3$) of red-brown stone was outlined by this drill program.

Granite. Evaluation of Nova Scotia granite deposits on the southern mainland and Cape Breton Island has begun. Several old granite quarries have been mapped and sampled to determine their suitability for curbing stone and cladding and dimension stone. Deposits in the Terence Bay area, Halifax County, may be very suitable for building stone. The best granite deposits will be drilled and evaluated during 1987.

Other Activities. A stone building inventory was begun in 1986 to catalogue all stone buildings in Nova Scotia. Over 100 buildings, constructed either in part or totally of stone, have been examined. Over 60 per cent of these are in the city of Halifax. The towns of Pictou, Amherst, Truro, New Glasgow and the city of Sydney also have a number of stone buildings.

Diatomite Project

Introduction. Diatomite or diatomaceous earth is a siliceous sedimentary mineral commonly found in lakes and bogs in the upper reaches of many watersheds throughout Nova Scotia. It has been formed by the accumulation of the skeletal remains of shells of tiny one-celled plants known as diatoms. Essentially composed of hydrous silica ($SiO_2.n.H_2O$), it is characterized by a low specific gravity, large surface area/volume ratio and high porosity; properties which make it valuable as a filter aid and as functional filler in a wide variety of products.

Most diatomite is used as a filter-aid in the food processing industry to clarify beer, wine and juices as well as vinegar, sugars, oils and fats (Table 4.). As a functional filler, diatomite is used primarily in the manufacture of paint and plastics as well as a chemical carrier, pozzolan and abrasive. The current market price and transportation costs of diatomite in eastern Canada and the U.S., as well as an apparent change in the demand for less expensive fillers, has renewed interest in the potential of local diatomite resources. Real growth potential, however, lies in the area of specialized products such as catalyst carriers, pozzolans, bacterial and enzyme support systems, pesticide and fertilizer carriers and bulk agents.

TABLE 4. Diatomite consumption by principal use.

	1980	1981	1982	1983	1984	1985
Filtration	66	64	68	66	67	66
Fillers	21	23	19	21	22	21
Insulation	3	2	1	3	1	1
Other[1]	10	11	12	10	10	12

[1]Other includes abrasives, absorbents, additives, catalysts. Source: Meisinger, A. C., "Diatomite." Minerals Yearbook, 1980-1985, U.S. Bureau of Mines, Department of the Interior

Activities, 1986 Fiscal Year. Research and review of the information available on diatomite occurrences and deposits has defined more than 106 occurrences and 18 deposits throughout the province. Each occurrence and deposit was summarized for entry into a database for easy retrieval and document generation.

Reports on the occurrences and deposits of diatomite in western and northeastern mainland Nova Scotia are currently available on open file in the departmental libraries. The final open file report will be made available early in 1988.

Two hundred and sixty samples were collected from 21 sites for analysis of diatomite quality (Fig. 6). The crude material was of variable colour, texture and density. However, most is described as a dark, soft material resembling grey, peaty clay.

Field checking and collection of samples from the significant deposits has defined a number of potentially mineable sites; however, final analytical results are currently not available for publication.

In an attempt to provide field assessment techniques to determine the quality of diatomite (i.e. SiO_2), comparison of wet and dry colours of diatomite samples were made using the Munsell Soil Colour System. The results showed a positive correlation on dry colour value and SiO_2 content. As would be expected, however, the large variability of the data within each value range does not support a reliable field estimate of silica content. Laboratory analysis will have to be continued at the existing level. On the whole, it was found that the chemical analysis of Nova Scotia diatomite earth is comparable to diatomite currently used as functional filler. To date, seven significant deposits of diatomite have been defined from field work in the past year. Approximately 1.3 million m^3 (45.9 million $ft.^3$) of diatomite have been estimated to occur in

seven deposits (Table 5). The largest most significant deposits are those found at Factory Bog in Digby County (once mined for diatomite), Brora Lake in Pictou County and Harris Lake, Digby County. The Harris Lake deposit is extensive, but large amounts of overburden exist which ultimately would limit the economic potential of this deposit.

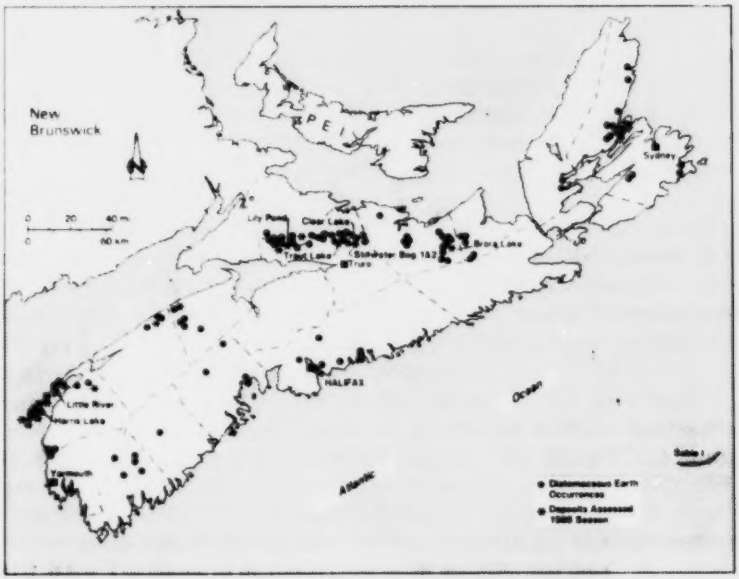

FIGURE 6. Locations of diatomaceous earth deposits and field investigations.

TABLE 5. Preliminary reserve estimates of diatomite deposits assessed during the 1986-87 fiscal year.

Deposit	Area (ha)	Acres	In Situ (m^3)	Volume ($ft.^3$)
Trout Lake, Colchester Co.	12	29.7	145 000	5.12×10^6
Clear Lake, Colchester Co.	5	12.4	72 900	2.57×10^6
Brora Lake, Pictou Co.	18	44.5	306 200	10.81×10^6
Lily Pond, Colchester Co.	1.3	3.2	16 250	0.57×10^6
Factory Bog, Digby Co.	19.5	48.2	362 100	12.79×10^6
Harris Lake, Digby Co.	18.2	44.9	337 000	11.9×10^6
Stillwater Bog #1 & #2	7.5	18.5	81 850	2.89×10^6
			1 321 300	46.65×10^6

Fillers and Extenders

The Fillers and Extenders Project was initiated in July of 1986 under the CNSMDA to determine the domestic and international market potential for filler minerals indigenous to Nova Scotia.

Mineral fillers are generally inert, finely ground mineral substances that are incorporated into the manufacturing of various products. They primarily serve to reduce the consumption of more expensive raw materials such as plastic resin or rubber. Extenders enhance the final product's usefulness by introducing some new property or properties.

The first phase of the project was the identification of local industrial users of filler minerals and the compilation of information on the international filler market. The second phase is to locate and analyze potential sources of filler-grade materials within the province.

The market study was completed in January of 1987 as the first share of the project. This investigation identified all industrial users of filler and extender minerals in the Atlantic Region. Quantities consumed, grade qualities and

supplier names were acquired when possible. A total of eight consumers were identified as users of the following fillers: calcium carbonate, kaolin, talc, barite, asbestos, silica and nepheline syenite. These local markets may be a potential starting point for any Nova Scotian filler mineral mining operation.

Field investigations located occurrences of potential filler-grade minerals such as muscovite, limestone, kaolinite, wollastonite and barite. Localities having resource potential will be sampled.

Of particular interest to this project and to the Industrial Minerals Group in general, is the improvement of the database on the Glencoe limestone deposit in Inverness County. Over 400 million t (440 million tons) of good quality stone have been defined. Some of this resource is potential filler-grade. The exploration program set for the fall of 1987 will establish the grade and tonnage of filler-grade limestone. Work has also been ongoing on a cross-sectional scale model of the Glencoe deposit using drillhole information from a diamond drill program conducted in 1975-76.

Other areas of interest in the province include Mica Hill in Victoria County, muscovite-bearing pegmatites throughout the southern mainland, barite at Lake Ainslie, kaolinitic clays at Musquodoboit and wollastonite at Lime Hill in Inverness County.

Gypsum/Anhydrite Project

The Gypsum/Anhydrite Project was initiated in June 1985 through the CNSMDA to develop an inventory of gypsum and anhydrite resources in the province. Three goals have been established for the project. The primary goal is to produce a comprehensive mineral inventory. The second is to increase and enhance relations between the Department and the province's present producers, the third is to initiate and encourage development of alternative utilization of Nova Scotia's gypsum and anhydrite resources.

During the 1986 field season, gypsum occurrences in Cape Breton, Richmond and Inverness Counties on Cape Breton Island, and in Hants County on the mainland, were mapped and sampled (Fig. 7). Over 200 samples were taken from numerous occurrences and these samples have been analyzed for gypsum, anhydrite and salt content. Additional analyses are underway. Results are presently being compiled on 1:250 000 base maps and areas of significance are being studied in detail, using existing drillhole information where available. Thus far, 73 separate surface and subsurface occurrences have been investigated (Fig. 7).

FIGURE 7. Locations of field work on the Gypsum-Anhydrite Project.

A small drilling program comprising eight drillholes totalling 647 m (2,103 ft.), was undertaken to investigate the potential for extractable reserves of gypsum and anhydrite in the Sydney Basin. Results, although still preliminary, reveal good reserves of both gypsum and anhydrite amenable to underground mining within the industrial Cape Breton area.

The development of a more open relationship between gypsum companies and the Department is an ongoing process. To date, two of the province's five major producers have allowed access to geological and technical information on deposits which they own in fee simple or for which they hold gypsum rights. Assistance, when requested, has been provided to all gypsum producers.

Several topics have thus far been investigated under the heading of alternate utilization of Nova Scotia's gypsum and anhydrite resources. A study on the market potential for agricultural gypsum was completed in 1986 and is available as OFR 86-039. Studies have been undertaken at McGill University into coal mine roadway packing systems which include anhydrite. These may help to encourage packing systems in Nova Scotia and elsewhere in North America, as has been the case in West Germany for more than 15 years.

Various Commodities Project

A Various Commodities Project was initiated in May 1986 to update and improve the database on several industrial mineral commodities which occur throughout the province and have important industrial uses. These commodities include andalusite, barite, beryl, brucite, dolomite, garnet, graphite, limestone, manganese, silica, spodumene, topaz, wollastonite and others that may surface as market demands change. Initial emphasis has been placed on the industrial mineral commodities which are presently most sought after in the market place. These include limestone and dolomite deposits, and to a lesser degree barite, celestite, graphite and silica.

A large percentage of the work to date has concentrated on data compilation and field investigations of limestone and dolomite deposits. Requests for assistance in locating additional resources have been made by users presently established within Nova Scotia, as well as others investigating the possibility of utilizing provincial resources. The present demand is for high calcium limestone deposits near existing user facilities and for large tonnage specialized dolomite deposits at or near deep water shipping points. Over 140 limestone and dolomite deposits were investigated and those meeting the above criteria were sampled for analysis.

A program of data compilation and field investigation has also been established for the other industrial mineral commodities previously mentioned. Figure 8 shows the locations of the major deposits that are being investigated during this project. These deposits are:

- high grade silica and garnet deposits at Chegoggin Point and Lake George, Yarmouth County
- limestone/dolomite deposits of Glencoe, Kewstoke, Glendale, Churchview, Kellys Cove, Cape Dauphin, Ingonish, Admiral Rock, Brookfield and Meander River areas
- alumina deposits at Doughboy Point and Dorts Cove, Guysborough County
- beryl and spodumene deposits in southwestern Nova Scotia
- various celestite, graphite, ilmenite, manganese, talc and wollastonite occurrences.

A geophysical survey which included magnetometer, VLF-EM and resistivity surveys has been completed on the Chegoggin Point and Lake George silica/garnet deposits in Yarmouth County. From this survey, targets have been isolated for a future diamond drilling program. Investigation has started on by-products from existing mining operations within the province.

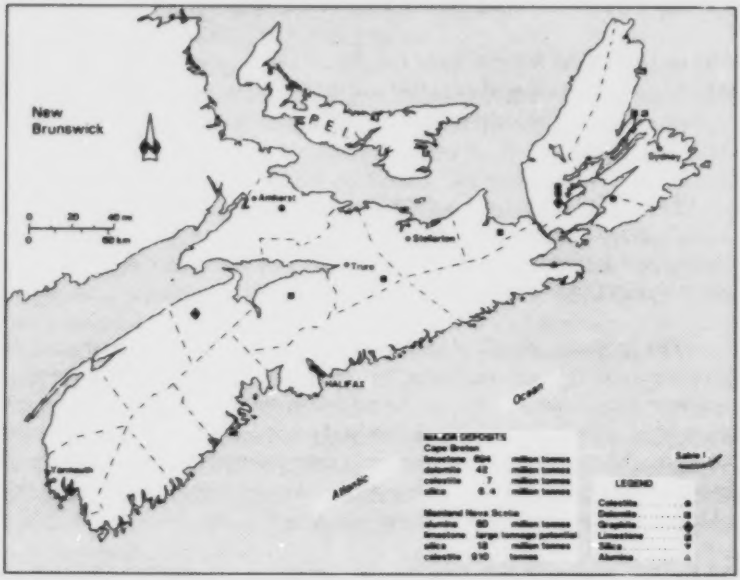

FIGURE 8. Deposits investigated by the Other Commodities Project.

METALLIC MINERALS

Gold Inventory Project

The objective of this CNSMDA funded project is to produce a comprehensive geologic compilation and review of the distribution and character of gold and other precious metals known to occur in the province. This project is important to exploration companies because of the diversity of geologic environments in which precious metals occur.

Phases one and two of this project have been completed. In phase one, more than 2000 references and articles on precious metals in Nova Scotia were reviewed. In phase two, selected occurrences were located, described and sampled to verify and/or update old information sources.

Phase three of this project is the compilation of a final report and accompanying maps, which is slated for completion in late 1987.

MINERAL LAND USE POLICY DEVELOPMENT

The purpose of the Mineral Land Use Policy Development Project is to gather information about mineral potential and land use; to prevent the alienation of lands for mineral development; and to inform planning groups about lands with mineral potential.

The staff of the project is gathering mineral resource land use information to study mineral industry requirements relative to the needs of other resource sectors, and to present a perspective on how and where the mineral resource sector should fit into provincial land use policy.

The project's overall objective is to promote proper management and protection of mineral resources by providing information and resource management guidance to the provincial and municipal planning community - those responsible for designating future land use in Nova Scotia. The project will also give land use planners clear and more accessible information on the province's mineral and energy resources to benefit the decision-making process of future land use zoning.

Mineral Resource Land Use Project (MRLU). The MRLU Project will produce a series of maps and handbooks for each county in Nova Scotia. The series will provide information on known mineral resources within each county, as well as information on existing land uses which have the potential to affect mineral exploration and mining.

This year, a land use planner was added to the staff to assist with the project's growing workload and to increase the production of the MRLU map and handbook series. An IBM-PC AT micro-computer was acquired to automate the database which will be used to produce data diskettes for municipal land use planners and resource managers.

During this fiscal year, maps and background text have been produced for most of Halifax County, and work is continuing in the development of an MRLU database. The land use staff has also produced a questionnaire directed to planners in the province so that the Department may learn what local concerns and issues are in each county regarding mineral exploration and mining. The results from the questionnaire will be compiled and made available as an Open File Report.

Aquaculture License Applications. In accordance with Section 9(3) of the *Aquaculture Act,* the Department of Mines and Energy was one of five government departments asked by Nova Scotia Fisheries to review all future aquaculture license applications for potential resource conflict. During this fiscal

year, Mines and Energy staff have reviewed 35 applications to identify potential conflicts between the fishing and mining sectors.

Land Use Issues. The land use staff have reviewed several land use reports and policies produced by government departments and private agencies. These are: a federal fisheries Proposed Policy and Procedures for Fish Habitat Management and a provincial Land Use Policy on Surface Watersupply Watersheds. Staff have also participated in departmental committee work such as the *Mineral Resources Act,* Review Committee on Aggregates, and have represented the Department of Mines and Energy on land use committees such as the Land Resource Co-ordinating Committee and the LRCC Conservation/Development Subcommittee of Voluntary Planning, Department of Development.

LIBRARY SERVICES

The Department maintains two technical libraries. A main library is located in the Halifax office with a branch library in the Stellarton office. Holdings include more than 7,000 maps, 4,016 exploration assessment reports, 747 open file reports, 814 open file maps, 550 theses, 200 different periodicals, journals, and trade magazines, and numerous reference texts and other document types. The libraries function as important resource centres for information on the geology, energy resources and mining history of Nova Scotia. To this end, the libraries provide the following services and facilities:

- reference and information service to the general public, provincial government personnel, professional geoscientists, engineers and consultants in private industry
- sale of departmental and Geological Survey of Canada publications and maps
- catalogued and classified files of the library holdings, including exploration assessment reports, open file reports, open file maps and theses
- a mailing list of individuals, institutions and corporations that wish to be informed of library activities and publication releases
- facilities for photocopying, microfiche reading and printing, and for making white print duplicates of maps
- sale of federally and provincially published topographic maps (Stellarton only).

The main library in the Halifax office continued to be busy with an increased demand for information services and products during fiscal year 1986-87. More than 2,000 people (excluding staff) made use of the library facilities. In addition, 900 telephone inquiries and 1,000 mail inquiries were answered. A summer student was hired to assist the regular librarian, and a librarian was

hired from April to September to do a literary search on the use of computers in libraries and to assist in cataloguing the backlog of books.

Revenue from the sale of more than 2,000 maps, 7,000 pages of photocopying, 5,400 pages of microfiche prints and 635 white prints totalled $17,753, while sale of departmental publications generated $8,270. More than 8500 publication release notices, 600 announcements for the annual open house and over 750 annual reports were mailed out. More than 500 inter-library loans were processed and over 320 orders for books and supplies were placed.

MINERAL INVENTORY

The Mineral Inventory group is responsible for the collection, verification, organization, and dissemination of mineral resources information. The main functions of the group are threefold: to verify that submitted exploration assessment reports comply with the regulations of the *Mineral Resources Act,* for the purpose of renewing exploration licenses; to establish and maintain databases of mineral resources information; and to publish pertinent compilations of mineral resources information for use by the Department, other government agencies, the mineral exploration industry and the general public.

As a result of funds obtained from the Department, the CNSMDA, and the 1986 Provincial Summer Employment Program, four major projects involving eight people were in operation during the fiscal year 1986-87. These projects were GEOSCAN Activities, Mineral Occurrences Databases, Drillholes Database, and the Gold Bibliography.

GEOSCAN Activities

Indexing and on-line data entry into GEOSCAN, the national bibliographic database for geological information, continued during the fiscal year 1986-87 for Nova Scotia Department of Mines and Energy assessment reports, publications, open file reports, open file maps, geoscience theses and journal literature references. *Report 86-2 Index to Assessment Reports 1981-1985* (with Keyword Index) was published in October, 1986. A new five-year (1981-1985) index for publications, open file reports, open file maps and theses will be published in 1987.

During 1986-87, 1,061 new departmental records were added to GEOSCAN. They consisted of 226 assessment reports, 185 publications, 213 journal literature references, 60 open file reports and 377 open file maps. By the

end of 1987, GEOSCAN contained 9,926 records from the Department, consisting of the following:

Assessment Reports	— 4,016
Publications	— 1,984
Journal References	— 1,104
Open File Reports	— 747
Theses	— 597
Open File Maps	— 814

Mineral Occurrences Databases Project

Updating of the Metallic Mineral Occurrences Database and the Industrial Mineral Occurrences Database with information gathered from all assessment reports, open file reports and publications available during the years 1981-1985 (inclusive), was completed during the fiscal year 1986-87. The Metallic Minerals Database now contains information on 1,053 metallic mineral occurrences, and the Industrial Minerals Database contains information on 1,073 industrial mineral occurrences. Both the Metallic and the Industrial Mineral Occurrences Databases were installed on an IBM AT micro-computer, using dBASE III PLUS as the database management system. Revisions to existing Mineral Occurrence Data (MOD) cards were started, and all the occurrences (23) on map sheet 11E/09 were checked and revised where appropriate.

Drillholes Database Project

Information on drilling in mineral exploration assessment reports has been used to create the Drillholes Database. The Drillholes Database has been installed on an IBM AT micro-computer, using dBASE III PLUS as the database management software. Complete listings of the contents of the Drillholes Database were published in June 1986 as *Open File Reports 86-019, 86-020 and 86-021 Drillhole Compilations from Open Assessment Reports,* covering central, eastern and western Nova Scotia respectively. The information in these reports covers all open assessment reports available up to the end of December 1985. Approximately 10,000 drillholes are represented in these open file reports.

Throughout the summer of 1986, a project was undertaken to add to the database all the drillholes reported in the departmental publications, *Drilling Logs of Government Core Drills,* which are available from 1901 to 1985. Approximately 6,350 drillholes have been coded, extending from 1985 back to 1955, and entered into the database.

Gold Bibliography Project

Compilation of information for the gold bibliography, to be entitled *Gold in Nova Scotia: a Bibliography of the Geology, and Exploration and Mining Histories from 1832 to 1986,* is well advanced and publication is expected in 1987. The bibliography will contain more than 1,300 references documenting over 300 gold districts and occurrences. The bibliography will be organized into three parts. Part one will be an alphabetical author index and part two will be an index by gold district, with each gold district being subdivided into an author index, an assessment reports index and a map and cross-section index. Part three will contain cross-reference lists between gold districts, counties and National Topographic System (NTS) maps.

MINERAL INVESTMENT STIMULATION PROGRAM (MISP)

Introduction

The Mineral Investment Stimulation Program (MISP) is the jointly funded federal/provincial vehicle designed to financially assist the private sector of the mining industry to develop or improve viable operations.

Assistance from MISP is available to approved projects up to a maximum of $50,000 per project. Funding of projects is shared with the private sector on a "dollar for dollar" basis. The maximum contribution from MISP would, therefore, be met with an equal commitment of $50,000 from a qualified individual or company.

Approved projects are for such purposes as detailing established ore reserves, applying innovative processing techniques and investigating new marketing opportunities.

Procedure

Each MISP application is assessed by a panel of appropriate experts drawn from the Department of Mines and Energy, and Energy, Mines and Resources Canada. Once a project has received approval, the applicant enters into a legal agreement with the province and the initial cash contribution is made.

Thereafter, the recipient submits interim and final reports, together with documentation of expenditures, to receive two further payments.

Benefits

The financial assistance extended under the program contributes revenue for the service industries in the short term and increased employment in the long term. Additionally, the program should create new domestic and export markets with all the attendant long term benefits.

Current Status

Nineteen projects have received approval since the inception of the program in October 1985. A total of $600,000 has been committed to assist these projects, of which nine have been completed with an encouraging degree of success (see attached table). Approximately $1 million is budgeted for the remaining two years that MISP will operate.

STELLARTON OFFICE

The Resource Geology Section maintains a regional office in the Department of Mines and Energy building on Bridge Avenue in Stellarton, Pictou County. Responsibilities and activities conducted by the regional office staff include liaison with, and monitoring of, the mineral exploration industry; supervision and operation of the drill core library; in-house technical support services and equipment storage; maintenance of geotechnical data and samples; library services; and inventory, distribution and sales of maps and publications. Regular permanent staff consists of one regional geologist, one project geologist, two mineral technicians and a stenographer/librarian.

Term Staff consists of a project geologist and a mineral technician in the core library, and a project geologist for Industrial Minerals.

Exploration Monitoring

Exploration monitoring provides a direct liaison with industry, through which the Department is able to maintain an awareness of current exploration activities throughout the province. The monitoring process provides continuous contact with industry personnel through regular visits to company offices and exploration sites. Problems and difficulties which may need addressing by the Department are identified, and assistance or advice is provided if necessary. In addition, the monitoring staff review assessments and other reports submitted by industry. They also carry out an annual statistical study of the industry as a whole, for a comprehensive analysis of the general health of the exploration industry. Reports, maps, compilations and tabulations are prepared to summarise industry activity, many of which are included in the annual Mines and Minerals Branch *Report of Activities*.

Progress was made during the year towards the preparation of a new annual publication which will be a single source reference for all data and information relevant to mineral exploration in the province, including short summaries of current activity at each significant mineral occurrence.

Map sales. The Stellarton office is an agent for Maritime Resource Management Service (MRMS), which is the principal map dealer in Nova Scotia for the Canada Map Office, Energy, Mines and Resources Canada. Topographic, geological and aeromagnetic maps are sold through the library.

Publications Storage. Stockpiles of departmental publications (reports and maps) are maintained at the Stellarton office and distributed as required.

Drill Core Library

Core Storage Facilities. Core library facilities consist of three buildings erected in 1982-83 in the Stellarton Industrial Park; one building in the Debert Industrial Park, Colchester County; one building near Malagawatch, Inverness County; and sheds and core racks at the Bridge Avenue, Stellarton office.

No major modifications, repairs or maintenance took place at either of the Debert or Malagawatch buildings during the year. At the Bridge Avenue location in Stellarton a second set of core racks, forming part of the original core storage facility, was emptied and the boxes of core were palletised in preparation for transfer to the fourth building in the Industrial Park. The core racks were removed and transferred to the Industrial Park location. Only one set of core racks now remain inside the Bridge Avenue building; the resulting additional space is being utilised for installation of additional sample cabinets. The exterior core sheds or lockers at the rear of the Bridge Avenue building, which hold approximately 26 000 m (83,302 ft) of racked core, were repainted in 1986.

At the Industrial Park location the three existing buildings were fitted with exterior sodium vapour lamps for optional night-time illumination of the yard, principally for truck unloading purposes.

During the 1986-1987 fiscal year, 14 145 m (46,407 ft.) of drill core from more than 187 holes drilled during the years 1980 to 1987 were received for inclusion in the core library collection and were stored in the Stellarton Industrial Park facility.

Forty-three per cent of the core received, 6 094 m (19,993 ft.), was derived from 16 departmental drilling projects, totalling 58 holes, conducted during the year. The remainder resulted from mining industry activity during the period 1980-1986.

TABLE 6. Drill core acquisitions to the core library, Stellarton, for the 1986-87 fiscal year.

NTS	Company or Organization	Year Drilled	Commodity or Project	Location	County	No of Holes	Hole Names	Core Size	Total Feet	Total Metres
11-D-13	Nolan, Davis & Associates	1984	Foundation testing	Halifax Airport	Halifax	13	H84-258-2 to H84-258-6	NQ	225	69
11-D-15	GSC/NSDME	1986	Mineral Deposits Studies	Lake Charlotte (Beech Hill)	Halifax	1	H84-273-2 to H84-273-15 LC-86-1	NQ	877	267
11-E-01	SCOMINEX (Inco Ltd.)/Acadia Mineral Ventures Ltd.	1984	Gold	Miller Lake	Guysborough	10	ML-84-1 to ML-84-10	BQ	1744	532
11-E-01	SCOMINEX (Inco Ltd.)	1985	Gold	Goldenville	Guysborough	8	72619 to 72625, 72627	BQ	6096	1858
11-E-01	NSDME Mineral Development Division	1986	Mineral Deposits Studies	Sinclair Lake	Guysborough	1	SL-86-1	NQ	1480	451
11-E-02	Four Seasons Resources Ltd.	1986	Gold	Beaver Dam	Halifax	3	4S.86-1 to 4S.86-3	BQ	1362	415
11-E-02	Pan East Resources Inc.	1987	Gold	Fifteen Mile Stream	Halifax	1	FS-86-14	NQ	744	227
11-E-03	Canada Cement Lafarge Ltd.	1983*	Limestone	Admiral Rock	Hants	2	AR-84-01 and AR-84-02	BQ	98	30
11-E-03*	Canada Cement Lafarge Ltd.	1985	Limestone	Brookfield	Colchester	5	BF-85-01 to BF-85-05	BQ	322	98
11-E-04	Granges Exploration Ltd.	1986	Gold	MacKay Section	Hants	4	MK-1 to MK-4	BQ	788	240
11-E-05	Cuvier Mines Inc./M.E.X. Explorations Ltd.*	ND	ND	Londonderry	Colchester	5	JEM-1, GEM-2	NQ	1735	529
11-E-05	Cuvier Mines Inc./M.E.X. Explorations Ltd.*	ND	ND	Londonderry*	Colchester	3	H-1, H-8, H-9	BQ	1052	321
11-E-06	Canada Cement Lafarge Ltd.	1984	Limestone	Manganese Mines	Colchester	1	MM-84-01	BQ	85	26
11-E-06	Canada Cement Lafarge Ltd.	1984-85	Limestone	Penny Mountain (Truro)	Colchester	16	PM-84-1 to PM-84-11 PM-85-12 to PM-85-17	BQ	2131	650
11-E-06	Canada Cement Lafarge Ltd.	1985	Limestone	East Mountain	Colchester	5	EM-85-01 to EM-85-05	BQ	224	68
11-E-06	Imperial Oil Ltd.	1970-1971	Copper	Mt. Thom	Colchester	48	1-48	BQ	10,924	3330
11-E-06	Nolan, Davis & Associates	1985-1986	Landfill Site	Truro	Colchester	11	H85-376-1A to H85-376-10	NQ	203	62
11-E-06*	Canada Cement Lafarge Ltd.	1984	Gypsum	Brookfield	Colchester	9	BRG-84-01 to BRG-84-09	BQ	933	284
11-E-07	Imperial Oil Ltd.	1972	Copper	Gordon Summit	Pictou	1	Hole 2	BQ	338	103
11-E-10	NSDME Mineral Development Division	1986	Building Stone	Sawmill Brook	Pictou	2	SMB-86-4 and SMB-86-5	BQ	129	39

Symbols: *means subject to confirmation
ND means no data

Core size: NQ = 1 7/8 in., BQ = 1 7/16 in., HQ = 2 1/2 in. and EX = 27/32 in.

TABLE 6. Continued

NTS	Company or Organization	Year Drilled	Commodity or Project	Location	County	No of Holes	Hole Names	Core Size	Total Feet	Total Metres
11-E-10	NSDME Mineral Development Division	1986	Building Stone	Caribou Road, Pictou	Pictou	3	CRP-86-1 to CRP-86-3	BQ	437	133
11-E-10	NSDME Energy Resources Division	1986	Coal	Frasers Mountain	Pictou	1	P-57	NQ	451	137
11-E-10	NS Department of Development	1986	Stone	Hardwood Hill	Pictou	3	McK-86-1 to McK-86-3	BQ	296	90
11-E-10	NSDME Energy Resources Division	1986	Coal	Chance Harbour	Pictou	1	P-58	HQ, NQ	2694	821
11-E-10	NSDME Mineral Development Division	1986	Building Stone	Eight Mile Brook	Pictou	4	EMB-86-4 to EMB-86-7	BQ	325	99
11-E-11	NSDME Mineral Resources Division	1986	Geology	The Falls	Colchester	1	TF-86-1	HQ, NQ BQ	2521	768
11-E-13	Chapman Brothers (Souris, PEI)	1986	Limestone	Pugwash	Cumberland	21	1 to 21	BQ	939	286
11-E-14	NSDME Mineral Development Division	1986	Building Stone	Wallace	Cumberland	8	WAL-86-1 to WAL-86-8	BQ	1111	339
11-F-05	Mono Gold Mines Inc./Victoria Resource Corporation	1986	Gold	Mill Brook (Tom Mann Lake)	Guysborough	5	MB-86-1 to MB-86-5	BQ	1168	356
11-F-11	Noranda Exploration Company Ltd.	1981	Potash	Kempt Road	Richmond	1	227-2	NQ	1091	333
11-F-14	NSDME, Mineral Development Division	1986	Building Stone	Graham River, Judique	Inverness	1	GR-86-1	BQ	13	4
11-F-14	Noranda Exploration Company Ltd.	1980-1981	Potash	Orangedale	Inverness	4	225-2 to 225-5A	HQ,NQ	6611	2015
11-F-15	Noranda Exploration Company Ltd.	1981	Potash	Estmere	Inverness	1	227-1	HQ,NQ	1693	516
11-F-16	NSDME, Mining Engineering Division	1986	Mineral Deposits Studies	Salmon River	Cape Breton	12	Yava 401 to Yava 412	BQ	1635	498
11-D-16	NSDME Mining Engineering Division	1986	Mineral Deposits Studies	Salmon River	Cape Breton	6	Yava 402A to Yava 410A	NQ	806	246
11-F-16	NSDME Mining Engineering Division	1987	Mineral Deposits Studies	Salmon River	Cape Breton	2	Yava 413 and Yava 414	NQ	117	36

Symbols: *means subject to confirmation
ND means no data

Core size: NQ = 1 7/8 in., BQ = 1 7/16 in., HQ = 2 1/2 in. and EX = 27/32 in.

TABLE 6. Continued

NTS	Company or Organization	Year Drilled	Commodity or Project	Location	County	No of Holes	Hole Names	Core Size	Total Feet	Total Metres
11-K-01	NSDME Mineral Development Division	1986	Gypsum	Morley Road/ Meadows Road	Cape Breton	8	MR-86-1 to MR-86-8	BQ	1,506	459
11-K-01	Nolan, Davis & Associates	1983	Foundation testing	Point Edward	Cape Breton	20	H83-182-201 to H83-182-221	BQ	128	39
11-K-08	NSDME Energy Resources Division	1987	Coal	New Campbellton	Victoria	1	NC-87-1	NQ,BQ	1,865	568
21-A-07	SCOMINEX (Inco Ltd.)	1986	Gold	Molega	Queens	8	BH 72628 to BH 72635	NQ	2,224	678
21-A-07	SCOMINEX (Inco Ltd.)	1985	Gold	Molega	Queens	3	M-85-1 to M-85-3 (72616 to 72618)	BQ	928	289
21-A-07	Bear Pass Resources Corporation	1985-1986	Gold	Pleasant River Barrens	Lunenburg	20	PR-85-1 to PR-85-5, PR-86-6 to PR-86-20	BQ	3,152	961
21-A-12	NSDME Mineral Resources Division	1986	Geology	Sissiboo Road	Digby	1	Digby 2 or MRR-D-2	HQ,NQ BQ	3,757	1 145
21-H-01	Cuvier Mines Inc./Preuvier Mines Ltd.	1984	Barite Base Metals	Lower Burlington	Hants	1	LB-84-1	NQ	128*	39*
21-H-01	Cuvier Mines Inc.	1983	Barite Base Metals	Sturgis (Walton)	Hants	3	ST-1 to ST-3	NQ	1,158	353
21-H-01	Cuvier Mines Inc.	1983	Barite Base Metals	Walton (South)	Hants	7	WS-4 to WS-9	NQ	3,235	986
21-H-08	Cuvier Mines Inc./M.E.X. Explorations Ltd.*	ND	ND	Five Islands	Colchester	1	H-1	BQ	65	20
21-H-16	NSDME, Mineral Development Division	1986	Building Stone	Amherst	Cumberland	3	AMH-86-1 to AMH-86-3	BQ	333	101
TOTAL						299			71,877	21 914

TOTAL: Government 59 holes 20,353 feet 6201 metres
Non-Government 240 holes 51,524 feet 15713 metres

Symbols: *means subject to confirmation
ND means no data

Core size: NQ = 1 7/8 in., BQ = 1 7/16 in., HQ = 2 1/2 in. and EX = 27/32 in.

A detailed listing of core received is shown in Table 6. More detailed descriptions of core received and on hand at the several locations may be obtained from core library personnel. The program of drill core acquisition from current and past diamond drilling is continuing. Receipts are lower than in the past few years because much of the backlog has been accommodated; much of the current core being generated by exploration companies in the search for gold is being used for whole-core analysis, rendering it unsuitable for inclusion in the core library. Some acquisitions have been deferred pending the construction of a fourth building in the Stellarton Industrial Park. Currently, the core library facilities contain in excess of 364 000 m (1,194,225 ft.) of core from approximately 4,480 holes.

Under the CNSMDA, funds have been allocated for the department to provide more storage space for drill core by constructing a fourth building in the Industrial Park and by installing a systematic program of discarding surplus core. During the year plans, specifications and drawings were finalized for the fourth building. Tenders were called and a contractor was selected; however, actual construction was deferred until the spring of 1987. In addition to core storage, the building will provide additional core examination and office space with improved amenities for both staff and visitors. A project geologist and a mineral technician, hired for the term of the CNSMDA, continued to evaluate large packages of drill core to document deterioration, previous excessive sampling, repetition and general suitability for retention in the core library collection. Core considered to be unsuitable or of low geological interest was recommended for disposal. No physical disposals were made, however, pending circulation of recommendations and reports to interested parties.

Work during this fiscal year consisted of completing a detailed evaluation of core from the Gays River area of Halifax County, and a detailed evaluation of approximately 15 000 m (49,213 ft.) of core obtained in 1984 from the former Magcobar-Dresser barite/base metals/silver mine at Walton, Hants County.

The work of collecting, sorting, listing and cataloguing drill core was aided by a provincial employment program, which helped fund two geological assistants in the core library for a total of 33 man weeks during the summer. A summer geological assistant was also employed under CNSMDA funding.

Geotechnical Data and Sample Storage. Five new sample cabinets received in 1985 were installed at Bridge Avenue for storage of chip samples from oil and gas exploration drilling.

Many containers of sample material from departmental programs of previous years were sorted and catalogued. Sample material received in recent

years from Gulf Minerals Canada Limited, Billiton Canada Limited, St. Joseph Explorations Limited (Sulpetro Mineral Limited) and Domtar Limited were also catalogued by the core library summer geological assistant.

Technical Support Services

Surveying. With the retirement at the beginning of the fiscal year of the departmental surveyor, this position was left unfilled. All required surveying is now being performed by the Mining Engineering Division, from the Halifax office.

Camp Support and Equipment Storage. Assistance was provided to departmental personnel for inventory and storage of geological, survey and field equipment and supplies, and for setting up and closing down of field camps. Transportation of equipment, publications and samples between offices, and to and from field camps was provided. Assistance was also provided to the Drill and Mechanical section for transportation of drilling equipment, for moving and setting up the bunkhouse and for vehicle recovery.

Other Services. Assistance and displays were provided for public awareness and educational functions and establishments, including the Nova Scotia Forestry Exhibition in Windsor, the Rockhound Roundup in Parrsboro, the Annual Meeting of the Mining Society of Nova Scotia in Ingonish, the Prospectors and Developers Association Annual General Meeting in Toronto and the Nova Scotia Department of Mines and Energy Open House and Review of Activities.

A collection of rocks and minerals is maintained in Stellarton for the preparation of small sets of representative specimens for teachers and students. Personnel were provided to speak to various classes of school children in the local area on the subject of minerals, rocks and jobs in the mineral industries.

ENERGY BRANCH

J. R. Hornby, PEng
Assistant Deputy Minister

Nova Scotia is heavily dependent on petroleum for its everyday needs. Approximately 62 per cent of its primary energy comes from petroleum, most of which is imported from foreign sources.

The provincial government has established a clear objective to reduce this dependence by developing Nova Scotia's indigenous energy resources; gaining access to Canada's energy resource base; and improving the efficiency of energy use.

The mandate of the Energy Branch is to initiate and implement policies and programs to achieve the government's energy goals. The Branch consists of two divisions — Energy Resources and Energy Management. The Energy Resources Division focuses on the development of Nova Scotia's indigenous resources, particularly offshore oil and gas, coal and peat. The Energy Management Division focuses on the acquisition of energy from outside the province and the utilization of energy within the province.

ENERGY RESOURCES DIVISION

A. G. Batcup, P Eng, Director

INTRODUCTION

The Energy Resources Division is accountable for the effective evaluation, promotion and regulation of Nova Scotia's energy resources. The Division's activities are primarily concerned with the two main hydrocarbon resource sectors: petroleum (oil and gas) and coal/peat. The locations of projects are shown in Figure 9.

In the 1986/87 fiscal year, the Division's activities were influenced directly and indirectly by the instability in the World Oil Price, which began the period at below U.S. $10 per barrel and ended at about U.S. $18. This wide variation and the attendent uncertainty regarding future price levels resulted in an understandable deferment of industry investment plans for both petroleum and coal.

Despite the uncertainty of international events, the Division was able to fulfill many of its objectives, setting the stage for a period of future stability and investment in the province's natural resources. The Petroleum Resources section was heavily involved in the negotiations leading up to the signing of the Canada-Nova Scotia Offshore Petroleum Resources Accord on August 26, 1986. Subsequent to the signing, section personnel were busy preparing implementing legislation and developing a regime for the offshore royalties which the Accord gives Nova Scotia the power to set and receive. During the year, an offshore land sale was successfully concluded and Texaco's desire to drill two exploration wells on Georges Bank gave rise to much public debate and comment. A proposal to the federal government to bring about early development of Nova Scotia's offshore gas fields was also prepared. Onshore, several exploration agreements were successfully renegotiated and rentals of $230,000 were collected from onshore license holders.

The Coal Resources section was able to assist in resolving a surface coal rights issue in Pictou County, and towards the end of the period was assisting Placer Developments Ltd. with its evaluation of Suncor's coal holdings in the area. A potential fuel peat project was postponed due to the fall in the world oil price. In its efforts to improve its liaison with industry, the section was able to carry out several coal geology studies in co-operation with the Cape Breton Development Corporation. Section staff were instrumental in obtaining funds to enable a coal-water fuel demonstration project, a coal gasification study and further coal liquefaction testing to begin. Quantity and quality evaluations of the Springhill Waste Dump were also carried out, with a view to future coal

reclamation activity and a new coal-oil co-processing proposal was carefully examined.

New Brunswick
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Sydney
HALIFAX
Ocean
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Sable I.
ENERGY RESOURCES DIVISION
1 Sedimentological Study of the Springhill Coalfield Region
2 Oil Shale Project*
3 Coal and Oil Shale Exploration
4 Sedimentology of the Hub Seam
5 Petroleum Exploration Monitoring
6 Offshore Petroleum/Natural Gas Evaluation
7 Onshore Petroleum/Natural Gas Evaluation*
Province Wide 8
* Indicates partial or complete project funding from Canada - Nova Scotia Mineral Development Agreement

FIGURE 9. Locations of Energy Resources Division projects.

Petroleum Resources Section

C. Andrew Parker, PEng, Manager

INTRODUCTION

The Petroleum Resources Section is responsible for monitoring, evaluating and regulating petroleum exploration and development activities onshore and, in conjunction with the Nova Scotia office of the Canada Oil and Gas Lands Administration (COGLA), offshore Nova Scotia.

The 1986-87 fiscal year proved to be an exciting and productive period, although the level of exploration activity on the Scotian Shelf decreased considerably. The Section's main activities were directed towards monitoring and evaluating offshore exploration and development programs as well as administrating onshore projects. During the period:

- a significant exploration program was maintained in the Sable Island area with five wells being completed in the fiscal year 1986-87

- second-round offshore exploration agreements were negotiated and finalized by the Canada-Nova Scotia Offshore Oil and Gas Board

- the Canada-Nova Scotia Offshore Petroleum Resources Accord was signed to replace the 1982 Canada-Nova Scotia Agreement on Offshore Oil and Gas Resource Management and Revenue Sharing; the accord gives Nova Scotia increased input into the management of offshore oil and gas exploration and development, including control over revenues from the offshore resources as if they were on land

- the fall in world oil prices caused offshore gas project development to be put on hold; however, considerable effort has been put into determining if small-scale oilfield development is feasible

- under the new onshore oil and gas exploration and production regulations, onshore exploration agreements were concluded with former onshore license holders.

OFFSHORE EXPLORATION AND DEVELOPMENT

During the fiscal year 1986-87, a substantial area of offshore exploration acreage was surrendered by interest holders and reverted back to the Crown. However, several second-round exploration agreements were concluded which should lead to future exploration activity. Following are the major events relating to existing rights which occurred during the year:

- Shell partially surrendered E.A. 276, reducing the land held from 98 983 ha to 56 994 ha (244,589 to 140,830 acres)
- E.A. 119 was renegotiated into E.A. 298, with a resultant land holding reduction from 118 407 ha to 110 700 ha (292,580 to 273,536 acres)
- E.A. 121 was renegotiated into E.A. 299, reducing the size from 116 038 ha to 92 166 ha (286,726 to 227,739 acres)
- Mobil surrendered the remaining 32 755 ha (80,936 acres) of E.A. 280
- Petro-Canada surrendered the remaining 67 995 ha (168,013 acres) of E.A. 285.

Following requests by industry, the Canada-Nova Scotia Offshore Oil and Gas Board put four parcels of land up for bid. Lands were awarded to the company prepared to expend the largest amount on work on the lands in question. As a result of this call, E.A. 300 was issued to Petro-Canada for the Panuke Block.

At the completion of the 1986-87 fiscal year, a total of 871 143 ha (2,152,565 acres) were held under active E.A. In addition to the active E.A.s,

there are 72 806 ha (179,901 acres) held by industry under significant discoveries. Eight million ha (19.7 million acres) of lands are currently not open to exploration on Georges Bank and lands under dispute with France in proximity of St. Pierre and Miquelon. A summary of these lands is presented in Table 7.

TABLE 7. Offshore land summary at the end of the 1986-87 fiscal year.

Company	E.A. Number	Description	Acres (ha)	(acres)
Husky	269	West Chebucto	91 350	225,723
Canterra	270	Whycocomagh	72 312	178,681
Shell	275	Penobscot	7 030	17,371
Shell	276	North Triumph	56 994	140,830
Shell	277	Alma	14 182	35,043
Mobil	279	South Sable	226 244	559,041
Mobil	283	Sable Island	186 757	461,470
Husky	286	Chebucto	4 103	10,138
Shell	298	Uniacke	110 700	273,536
Shell	299	Glenelg	92 166	227,739
Petro-Canada	300	Panuke	9 305	22,992
Subtotal			871 143	2,152,564
Significant Discovery Lands			72 806	179,901
Rights not currently open to exploration - Georges Bank and St. Pierre and Miquelon			8 000 000	19,767,729
TOTAL			8 943 949	22,100,194

Industry expressed interest in commencing exploration activities on the Canadian portion of Georges Bank. An environmental screening document was prepared by COGLA. Texaco Canada Resources Limited undertook discussions with fishermen and held public meetings to discuss possible drilling plans. At year end, no decision had been made on when drilling would be allowed to commence on Georges Bank.

Five wells were completed during the fiscal year 1986-87 and are described in Table 8.

TABLE 8. Offshore well information.

Well Name	Operator	Type of Well	Results
Tantallon M-41	Shell	Exploration	Dry and Abandoned
Thebaud C-74	Mobil	Delineation	Gas Well
Chebucto K-20	Husky	Exploration	Dry and Abandoned
Glenelg N-49	Shell	Delineation	Gas Well
Panuke B-90	Shell	Exploration	Oil Well

The Petroleum Resources Section worked with COGLA in the day-to-day administration of ongoing drilling activites for these wells.

With regard to offshore gas development, the Thebaud C-74 delineation well resulted in increased reserves being proven for the Thebaud Field. Mobil, the operator of the fields planned for the initial development (Venture, South Venture and Thebaud), continued to assess various options that would reduce project costs to help counteract the fall in world oil prices. Staff from the Petroleum Resources Section investigated various development scenarios for the total discovered gas resource offshore Nova Scotia, and prepared a fiscal proposal to the federal government to help bring about the early development of offshore gas.

The successful delineation of the Cohasset oilfield in the fiscal year 1985-86 led to renewed efforts to determine the feasibility of small-scale oil development. This may lead to increased exploration activity related to oil development offshore Nova Scotia.

Canada-Nova Scotia Offshore Petroleum Resources Accord

The Canada-Nova Scotia Offshore Petroleum Resources Accord was signed on August 26, 1986. This accord replaces the March 1982 Canada-Nova Scotia Agreement on Offshore Resource Management and Revenue Sharing. The prime objective of the accord is to foster a spirit of continued agreement and co-operation between Nova Scotia and the federal government so that the following goals can be achieved:

- early development of oil and gas in the Nova Scotia offshore area
- protection, preservation and advancement of national security of supply
- a stable, consistent administrative regime reflecting the equality of both governments in the management of the resource

- enhanced employment and business opportunities for all Canadians, particularly for Nova Scotians
- allocation to Nova Scotia of responsibility for, control of and revenue from fiscal instruments as if the resources were on land
- provision of financial benefits to Nova Scotia, equivalent to those it would have received had it exercised its Crown share option.

ONSHORE EXPLORATION ACTIVITY

Five exploration agreements were concluded for onshore Nova Scotia in the fiscal year 1986-87 (Table 9). Four of these were to former license holders who exercised their exclusive right to negotiate E.A.s on lands previously held under the Petroleum and Natural Gas Act.

TABLE 9. Summary of onshore oil and gas rights holders.

	Negotiated Area		No. of E.A.s	Rentals
Licensee	**(acres)**	**(ha)**	**Negotiated**	**Paid**
Chevron Canada Resources Ltd.				
Cumberland	2,581,171	1 045 008	2	$195,975.95
	1,453,998	588 663		
Sigma Resources Inc.	371,618	150 452	1	18,287.28
Miles	315,468	127 719	1	15,320.42
Consultants A.G.R.E.N. Canada Inc.	46,780	18 939	1	2,339.00
TOTAL	4,769,035	1 930 781	5	$231,922.65

Consultants A.G.R.E.N. Canada Limited, new explorers to onshore Nova Scotia, acquired an E.A. to lands in the Kennetcook area of Hants County. They undertook a refraction geophysical survey on these lands in this period.

OTHER RELATED ACTIVITIES

The Section finalized the collation of a large volume of past data concerning onshore oil and gas shows, wells and geophysical information. Final reports, *Petroleum Wells, Drillholes and Petroleum Significance* and *Surface Petroleum Shows*, have been published.

The Section was involved in the preparation of joint federal-provincial legislation to implement the accord. Also, the Section provided input for Nova Scotia's response to the Canada Oil and Gas Lands Administration on proposed amendments to the Canada Oil and Gas Drilling Regulations, Operations Regulations, Offshore Diving Regulations, Oil and Gas Occupational Health and Safety Regulations, and to the recommendations of the Royal Commission on the Ocean Ranger Marine disaster.

The Section, in conjunction with the Departments of Finance and Attorney-General, developed Nova Scotia's offshore royalty regime and proceeded with drafting of legislation and regulations to implement it.

The Petroleum Resources Section participated in a joint industry-government research and development program to enhance offshore safety, by contributing towards the cost of the project to improve the recovery of lifeboat occupants during severe weather conditions. Staff closely monitors the development of such programs.

The Section initiated an onshore source rock study which will be funded by the CNSMDA.

The Section produced an update of the annual publication *Oil and Gas Exploration in Nova Scotia.* It has compiled a variety of maps and display materials for, and participated in, the Canadian Offshore Resources Exposition as well as the Department of Mines and Energy Open House.

Staff of the Section continued to be active on several committees:

- Offshore Safety Training Program Committee
- Environmental Co-ordinating Committee
- Sable Island Environmental Advisory Committee
- Canadian Standards Association (CSA) Steering Committee for Offshore Structures.

Coal Section

C. E. Bain, PEng, Manager

INTRODUCTION

The Coal Section of the Energy Resources Division comprises of two groups: Coal Exploration and Coal Development.

The objective of the Coal Exploration group is to assess the coalfields of Nova Scotia to determine the availability, quantity and quality of underground and surface deposits of coal. This group collects and analyzes field program data and provides technical assistance in coal exploration and development matters to industry and to other government departments.

The goal of the Coal Development Group is to encourage and co-ordinate the development and efficient use of coal and coal products. Specific activities within this mandate include:

- monitoring demand for coal within the province and encouraging its use as a substitute for imported fuels
- monitoring international developments in coal conversion and utilization technologies and determining their relevance to Nova Scotia
- assessing and monitoring coal supply with a view to identifying new coal mining opportunities
- assessing proposals from private sector coal exploration programs
- preparing coal and peat development and utilization policies.

In summary, the role of the Coal Section is to explore, evaluate and promote the development and use of coal resources within the province.

DEVELOPMENT AND UTILIZATION

The future of coal, which is one of the province's most important resources, will depend on the development of new uses and the introduction of optimum mining, processing, handling and transportation systems. The Coal Section monitors research and development activity related to coal utilization to evaluate its application to the Nova Scotian coal industry. The Section is involved in various research and development projects within the province including coal beneficiation, fluidized bed combustion, coal liquid mixtures and coal liquefaction.

On an ongoing basis, the Coal Section analyzes barriers to expanded coal utilization and directs research toward solving them. Coal transportation, blending facilities, optimum use of existing infrastructure, cost-effective means of

reducing combustion emissions and market competition with alternate fuels are just a few of the issues being addressed by the Department.

Committee on Atlantic Coal

The Committee on Atlantic Coal (CAC), established in 1982, brings the scientific expertise from diverse institutions in the Atlantic Provinces to bear on specific problems related to the mining and utilization of coal, and facilitates communications between the industry and the research and development community.

Funding for the Committee from the federal government ended in 1985. Since then, new sources of funding have been pursued. In 1986, the Cape Breton Development Corporation committed $250,000 for coal research and development for the fiscal year 1987/88, subject to matching funds from Energy, Mines and Resources Canada.

Coal-Related Research

The Coal Section continued its involvement through 1986 with projects to:

- develop a direct liquefaction process for Nova Scotia coals that can sustain high liquid yields of good quality
- assess and develop the beneficiation potential of eastern Canadian coals
- determine the rheology characteristics and the corrosion/erosion effects of coal liquid fuels
- assess the feasibility of using a commercial-sized circulating fluidized bed unit with Nova Scotia coal.

Coal Liquefaction. The Department of Mines and Energy continued to fund the coal liquefaction research program at the Nova Scotia Research Foundation Corporation (NSRFC) laboratories in conjunction with Energy, Mines and Resources Canada. Extensive test work on two-stage direct liquefaction continued in 1986 at NSRFC with the objective of developing a process suitable for Nova Scotia coals that can sustain high liquid yields (approximately 5 barrels per tonne of coal). Thermal/catalytic and catalytic/ catalytic processes are being tested with several catalysts and three coals — Prince, Lingan, and Donkin-Morien. This research program, which will continue until at least March 1988, will identify the most reactive coal and the relative merits of various two-stage process configurations. This investigation will be complemented by some longer term tests (20 day runs) funded by the Oil Substitution Agreement.

Coal Beneficiation. The Coal Section continued its involvement through 1986 in the project to "Assess and Develop the Beneficiation Potential of Eastern

Canadian Coals." This program is being carried out under the auspices of the Committee on Atlantic Coal with funds provided through Energy, Mines and Resources Canada's Coal Utilization Program.

The final phase of the program, which will review and summarize information from previous phases and determine the optimum beneficiation methods and rejects utilization for eastern Canadian coals, is nearing completion. The results will be presented in a final report expected in mid-1987, and later at a technical seminar.

Coal Liquid Mixtures. During the 1986/87 fiscal year, research on two coal liquid fuel projects was funded through the Canada-Nova Scotia Oil Substitution and Conservation Agreement.

The research projects were:

- Rheology and Spray Testing. This program, being conducted at NSRFC, is designed to establish testing facilities to determine the specifications of various coal liquid fuels and how these specifications can be modified to make the fuels more compatible with user needs and facilities. At present, there are no such testing facilities for coal liquid fuels in Canada.

- Determination of Optimum Ash. This study is currently being conducted at the Centre for Energy Studies. Its purpose is to determine the corrosion and erosion effects of coal liquid fuels with various ash levels on boiler tubes and heater surfaces. The study indicates that tube deposits can be removed by soot blowing, using steam. No visibly detectable erosion of the tubes occurs after the equivalent operation to 1620 hours in a coal-fired boiler.

Fluidized Bed Combustion. A study to determine whether Nova Scotian coals can be economically utilized in a 150-megawatt, commercial scale, circulating fluidized bed unit was funded under the Oil Substitution Agreement and is being conducted by Nova Scotia Power Corporation.

Coal Gasification Technology. Because of its ability to meet stringent environment restrictions and its potential for high efficiency, coal gasification technology could help to promote the use of Nova Scotian coal as an alternative to imported oil. The Atlantic Coal Institute will carry out a study to select the most appropriate Nova Scotia coal for gasification along with the most appropriate coal gasification process.

Oil Substitution and Conservation

The Canada-Nova Scotia Oil Substitution and Conservation Agreement was initiated in 1977 to reduce Nova Scotia's dependence on imported oil through conservation and displacement by coal or renewable resources. The program was scheduled to be completed by March 1987, but has been extended until March 1989 to allow completion of approved projects. New projects will not be considered after March 1987.

Projects submitted under this agreement are approved and monitored by two federal and two provincial representatives. The Coal Section administers the day-to-day details of the program.

During the 1986/87 fiscal year, a total of seven projects were considered for funding under this agreement. Two of these were turned down; three projects are still waiting for contracts to be signed. The two projects for which contracts were signed are:

- Study of Coal Gasification Technology Applied to Eastern Canadian Bituminous Coal

- Work Program for Laboratory Testing and Engineering Evaluation of Two-Stage Direct Liquefaction Applied to Nova Scotian Coals.

Further information on most of these projects can be found in other sections of the report.

COAL GEOLOGY

In the fiscal year 1986/87, the Coal Section continued to evaluate the provincial coal resources and maintained liaison with private companies engaged in coal mining or exploration. The section also continued involvement with several projects funded under the CNSMDA including the federally-financed Coal Database project and seismic survey, and the provincially-funded oil shale assessment.

Coal Database

Work continued on a co-operative program implemented by the Geological Survey of Canada (GSC) and Nova Scotia Department of Mines and Energy to construct a comprehensive computer database of coal geological and analytical data for the coalfields of Nova Scotia. During the second year of the project, work involved preparing data files for coalfields of the Cumberland Basin, as

well as entry of additional borehole and analytical information from the Cape Breton coalfields.

Information from boreholes, outcrops and mining operations is interpreted and rationalized using a well-defined, consistent set of procedures and standardized descriptions. Data entry, modification, and retrieval functions available for the National Coal Inventory database allow efficient input and editing, utilizing the GSC's computer in Calgary via an onsite terminal in Halifax.

To date, 982 boreholes with an aggregate footage of 93 580 m (307,000 ft) have been entered, as well as over 1,400 coal sample analyses from these boreholes. Some 3,000 channel samples from underground mines with both lithologic and analytical data have been entered into the database. Work is continuing on entry of data from the Cumberland Basin, and preparation of files for the Pictou Coalfield will commence in 1987/88.

Coalfield Geology

In the fiscal year 1986/87 geological investigations continued in the Sydney, Pictou and Cumberland coalfields. A summary of coal investigation in western Cape Breton was initiated.

Sydney Coalfield. In Sydney, co-operative applied research projects have been undertaken with the Cape Breton Development Corporation and are aimed at understanding the impact of sedimentary phenomena upon coal quality and mining. This initiative is designed to assist industry and maintain a knowledge of geological factors that impact on the coal resources.

At New Campbelltown, drilling began to investigate the stratigraphy of the Morien Group with respect to the reported presence and limited mining of coal in that area.

Pictou Coalfield. In the Pictou coalfield, reassessment of the stratigraphy continued during the year, aided by the exploration activity of Suncor Incorporated who continue to investigate the mining potential of the field. A report is being prepared on this work.

Single holes were drilled at Frasers Mountain and Chance Harbour to investigate the Munro seam that outcrops on Frasers Mountain and the stratigraphy of that area which lies north of the Pictou coalfield. The hole on Frasers Mountain intersected the Munro seam and samples have been sent for analysis. No coal was intersected in the Chance Harbour hole.

Cumberland Coalfield. In the Cumberland Basin, palynology sampling was conducted in the Joggins and Spicers Cove areas to determine the ages of major deposystems and various coal areas within the basin, and to enhance the reconstruction of the paleogeography and subsequent formulation of coal exploration models.

Geological mapping continued in the Springhill area and a geology map of the coalfield is to be published.

Coal waste banks at Springhill were sampled for float-sinks, sieve and proximate analyses and coal estimates given.

Western Cape Breton Island Coalfield. A summary of coal exploration in the coalfields of western Cape Breton was initiated. The summary is a synthesis of work carried out by both the coal section and private industry, and includes onshore exploration and offshore seismic work on the submarine extensions of the coalfields. The results of this work are shown in Figure 10.

Seismic Surveys

In the Cumberland Basin, 50 line km of shallow, reflection seismic was run across the Athol syncline from Springhill to Newville Lake and River Hebert to delineate structure. Marine seismic reports were received in fiscal year 1986/87 on work carried out at Port Hood and Inverness in 1985.

OIL SHALE ASSESSMENT

Evaluation of provincial oil shale deposits continued in fiscal year 1986/87. Initially begun in 1985, the three-year program was designed to assess the quality and quantity of the various oil shale occurrences.

During 1986/87, work was conducted in the following areas: Stellarton Basin, Trenton Syncline, Horton Bluffs, Joggins, and in Richmond County (Figure 11).

Stellarton Basin

Field work conducted in conjunction with the oil shale project has been used to compile a 1:5000 scale geological map of the east end of the Stellarton Basin (NSDME open file report 86-052). Forty-five oil shale units have been identified. The units are silicate-rich, one to 35 metres in thickness and have a hydrocarbon yield from .8 to 180 mg/g and an organic carbon content of 1.04-40.9 weight per cent.

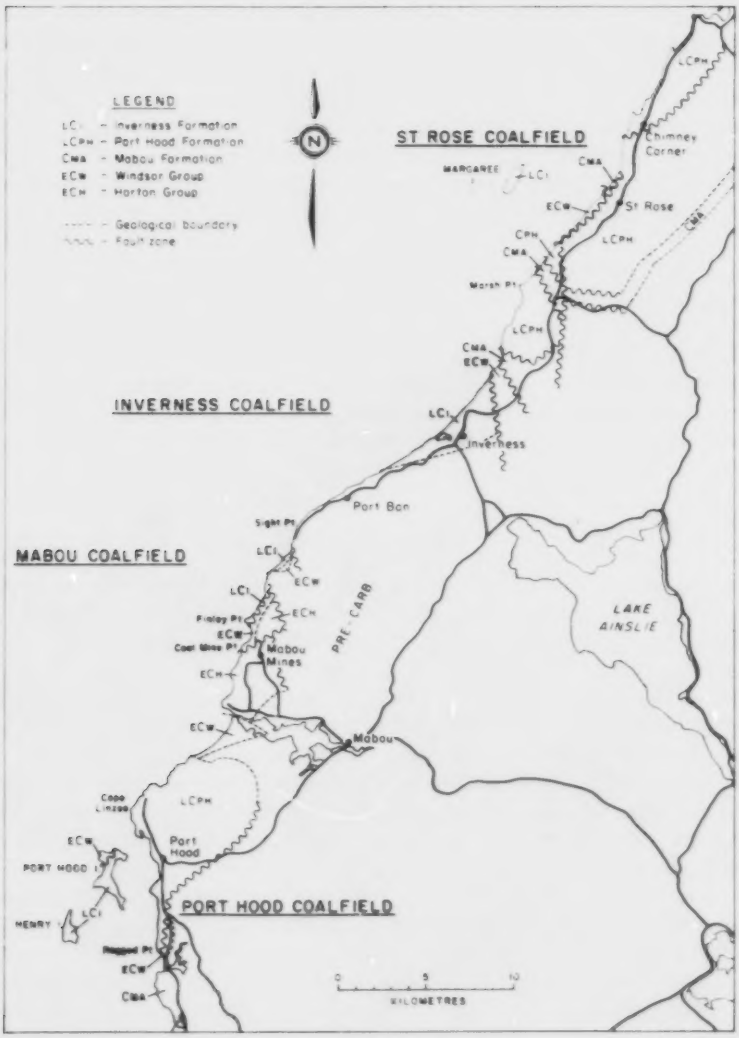


FIGURE 10. Western Cape Breton Island coalfields.

Petrographic examination of the oil shales indicates that they can be classed into three groups: cannel shale; boghead shale; and lamosites. Further information regarding the petrography and chemical properties of the Stellarton Basin oil shales is contained in Nova Scotia Department of Mines and Energy open file report 86-051.

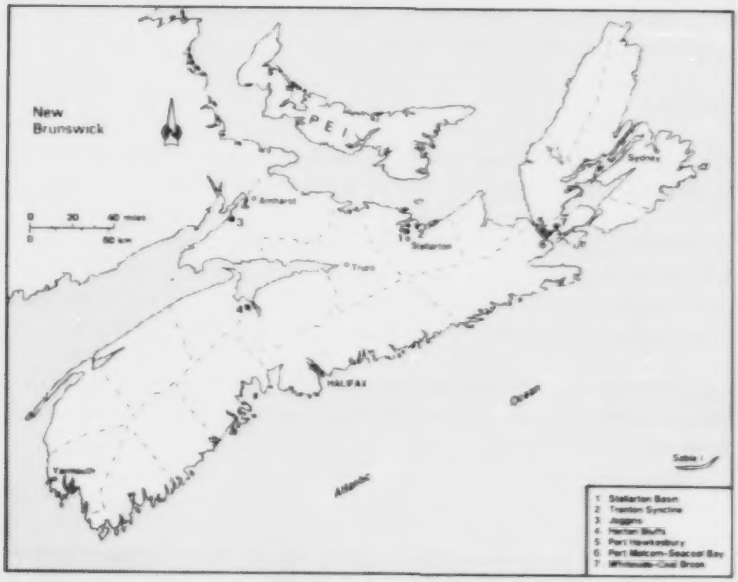


FIGURE 11. Locations of oil shale occurrences investigated during the 1986-87 fiscal year.

The oil shale units are also used as marker beds in studying the structural and stratigraphic relationships within the basin and have proved useful in coal exploration in the area. Future work will investigate the coal-oil shale relationship on the eastern margins of the basin.

Additional information on the geology of the oil shales of the Stellarton Basin can be found in the 1985 and 1986 *Reports of Activities* for the eighth and ninth Open Houses and the *Review of Activities*.

Trenton Syncline

Two exploratory drill holes, 146.75 m and 845.70 m long, were drilled for coal and oil shale respectively.

The first hole, P57, intersected three coal seams (0.3-1.2 m thick) and 28 oil shale beds (0.2-1.0 m thick) at a depth of 13.0-63.2 m; coal and oil shale account for 4.2 and 20.9 per cent of the interval thickness, respectively. The oil shales have an organic content of 4.11-12.59 wt. per cent, are immature to only slightly mature, and give yields ranging from 11.53-74.72 mg/g. The Munro coal seam was cored at a depth of 90.5-101 m.

The second hole, P58, intersected only one oil shale bed; it was encountered at a depth of 447.53-447.64m.

Joggins

On a coastal section lying between Lower Cove South to Hardscrabble Point, eleven petroliferous units, each less than one metre in thickness, were examined.

Representative samples taken from black pelecypod-bearing shales and bituminous limestones were analyzed using Rock-Eval pyrolysis. Hydrocarbon yields ranged from 2.23 to 25.14 mg/g for the shale and 1.02 to 13.68 mg/g for the bituminous limestone.

Although hydrocarbon yields are low, the high carbonate content of the bituminous limestones may make them suitable for combustion with coal in a fluidized bed burner unit.

Horton Bluff

Strata exposed on the shoreline at Horton Bluff were examined and four samples, taken from four separate beds, were sent for Rock-Eval pyrolysis and organic petrology.

The Rock-Eval pyrolysis indicated that the samples are mature (within the oil window) and have a moderate source rock potential with hydrocarbon yields up to 4.97 mg/g and organic contents of 0.38-1.52 wt. per cent.

Organic petrology results are pending.

Richmond County

Exposures of dark organic-rich shales were examined at Port Hawkesbury, Port Malcolm — Sea Coal Bay, and Whiteside — Coal Brook, four samples were obtained for Rock-Eval pyrolysis.

The beds at Port Malcolm — Sea Coal Bay and Whiteside — Coal Brook are thermally mature and have a moderate to good source rock potential with yields of 3.49 to 8.16 mg/g and 5.15 mg/g respectively. The beds sampled at Port Hawkesbury are overmature, give yields of only 0.58 mg/g and have little or no source rock potential.

ENERGY MANAGEMENT DIVISION

Director, Vacant

INTRODUCTION

The Energy Management Division has four primary responsibilities. It

- evaluates and analyzes policies and technologies affecting energy supply and demand
- co-ordinates energy planning and provincial submissions to energy regulatory agencies
- provides energy management and conservation programs, fuel substitution programs, and renewable and indigenous energy resource programs
- provides programs that increase public awareness of energy conservation, energy supply options, provincial energy policies, plans and programs.

ORGANIZATION

The division is composed of three sections: Energy Programs, Economics and Statistics and Energy Project Engineering. The Energy Programs Section includes the Provincial Energy Analysis Program, which delivers energy analysis and follow-up programs to the public sector and, during fiscal year 1986/87, to the small business sector; Residential Energy Programs,which provides energy conservation services to the residential and transportation sections; and the Energy Education Program, which provides educational information on energy use and fuel substitution to students and educators.

The Energy Project Engineering Section provides the planning, execution and management of technical studies and energy conservation and renewable energy projects. The Economics and Statistics Section is responsible for providing energy planning, policy evaluation, statistical analysis and regulatory submissions.

ACTIVITIES

A key achievement during fiscal year 1986/87 was the publication in May 1986 of a new 20-year energy plan for Nova Scotia. Completed with the assistance of staff from all sections as well as the Energy Resources Division over a two-year period, Energy Plan 1985 outlines the broad policy options available to the province in the energy area, to the year 2005. It also sets out specific initiatives that can be undertaken by the province in the medium term to achieve its objectives of energy stability and economic development.

The Division continued to be heavily involved in the monitoring and analysis of issues relating to development of offshore hydrocarbon resources, especially gas markets, energy pricing policies, U.S. and Canadian regulatory procedures, and gas distribution and transmission scenarios. As part of this work, the Economics and Statistics Section composed the province's submission to the National Energy Board for hearings into Canadian natural gas surplus determination procedures.

A new agreement with the federal government on conservation and renewable energy projects was signed in May 1986. The Memorandum of Understanding on Conservation and Alternative Energy (MOU), a two-year agreement covering the 1986/87 and 1987/88 fiscal years, outlines $6.7 million in joint and complementary activities. The Division also manages funds provided by the Canada-Nova Scotia Oil Substitution and Conservation Agreement Fund, for projects to develop a wood chip industry in Nova Scotia and to assess the potential for comprehensive residential heating system tune-ups.

Staff were also involved in significant events in the development of a wood fuel market in Nova Scotia. A new $900,000 wood boiler, funded with the assistance of the federal and provincial governments, was opened at Britex Limited, Bridgetown, Annapolis County. Staff assisted the Select Committee of the Legislature on Forestry in the analysis of wood chips and biomass and prepared pre-feasibility analyses for the government and private sectors on wood fuel projects.

Also of significance in fiscal year 1986/87, was a sharp decline in the average price of imported crude oil. This reflected a steep drop in world oil prices. The average cost of imported crude oil fell from ($40.84/barrel) Canadian in December 1985 to a low of ($16.86/barrel) in July 1986, before recovering to $21.73 by December 1986. Analyses of the impact of this sharp drop in crude prices was the primary responsibility of the Economics and Statistics Section.

As part of this work, the Section also contributed heavily to the province's submission to the Board of Commissioners of Public Utilities; hearings were called by the board on petroleum product pricing in the province. These hearings, held in March 1987, resulted in a board order to oil companies in early April 1987 to reduce by 2.5 cents/L (0.55 cents/gallon) the price of petroleum products.

Division energy management programs continued to enjoy a favourable public reception in 1986/87. Staff of the Provincial Energy Analysis Program performed energy analyses on 348 small business and government buildings.

Requests from homeowners for publications and information on energy management and renewable energy continued to number in the thousands annually, and technical assistance to industry and business continued to be provided. The Solar and Wind Provincial Sales Tax Rebate Program authorized rebates of $58,356 in 1986/87, based on inspections of 191 solar projects and one wind project, with a total installed cost of more than $811,277.

The Division is now using a new, computer-based model designed by staff to produce statistical reports on a monthly basis. Primary energy consumption in Nova Scotia increased 4.3 per cent during the 1986 calendar year to 235.90 trillion BTUs. This follows a decline of 2.1 per cent in 1985. Petroleum accounted for 60.1 per cent of primary energy consumption in 1986, down from 62.5 per cent in 1985. Primary energy use is defined as the total energy input into the economy and includes petroleum, coal, hydro, electricity and natural gas.

Sales of refined petroleum products increased in 1986 by 0.3 per cent, following a 4.1 per cent decline the previous year. The 22.8 million barrels (3628 thousand m^3) used in 1986, is down from 33.4 million barrels (5306.1 thousand m^3) in 1978. This reflects the continued success of the province's oil substitution and energy conservation programs.

Division staff represent the Department on a variety of national and international committees dealing with energy issues of concern to the province. The Northeast International Committee on Energy (NICE) was established by the Eastern Canadian premiers and New England governors as a result of the growing regional nature of energy trade and common energy concerns. In February 1987, the province hosted a NICE-sponsored conference on "Energy Policy and Planning During Oil Price Decline."

Division personnel represented the Department on the demand restraint sub-committee of the Interprovincial Advisory Committee on Energy (IPACE), the Energy Sector of Voluntary Planning, and committees of the Canadian General Standards Board and Canadian Wood Energy Institute, among others.

ENERGY AWARDS

Each year the Division sponsors the Nova Scotia Energy Awards. Presentations are made by the Minister of Mines and Energy for outstanding contributions to energy management or fuel substitution. The following is a list of 1986 Nova Scotia Energy Award winners.

Category 1, Large Manufacturing

National Sea Products Ltd., Louisbourg Plant, Louisbourg

- Reduced energy costs by more than $500,000 per year by installing a high efficiency boiler and an energy efficient fish reduction plant, and by continuation of a plant energy conservation program.

Scott Maritimes Ltd., New Glasgow

- Reduced oil consumption by 1.5 million gallons per year by installing a hydrogen-burning, energy-efficient lime kiln with heat reclamation and computer control.

Category 2, Business, Commerce and Non-Government

Sears Canada Inc., Dartmouth

- Through a combination of reduced equipment usage, manual control of certain aspects of their heating and cooling systems, and a good understanding of their mechanical systems, this store saved 196,800 KWH of electricity per year with no capital outlay.

Maritime Testing (1985) Ltd., Dartmouth — Honourable Mention

- Replaced a propane-fired oven used to prepare soil samples for laboratory tests with an open air drying rack and large portable fans. An initial capital expenditure of $100 produced an annual saving of $500 in fuel costs.

Category 3, Government

City of Halifax

- Over a five-year period, the city took over ownership and maintenance of street lights and converted all to energy-efficient, high pressure sodium fixtures. This initiative has resulted in combined energy and maintenance savings of over $300,000 per year.

Category 4, Organizations and Community Groups

American Society of Heating, Refrigeration, and Air Conditioning Engineers, Halifax Chapter

- This professional society sponsored a professional development seminar on air system design and retrofit for energy cost-effectiveness in Halifax.

St. Augustine's Anglican Church, Halifax — Honourable Mention

- Insulation in their hall, installation of a new heating system, additional heating zones, and fitting of storm windows have reduced energy consumption and improved comfort conditions in this 25-year-old structure.

Category 5, Energy Innovation

Purdy's Wharf Development Ltd., Halifax

- This new 350,000 square foot office complex uses cool ocean water to provide building cooling. This concept, developed by the owners, is believed to be the first installation of its kind in North America.

Category 6, Individual

Willis S. Harvey, Chester

- Over a five-year period, Mr. Harvey has reduced his home energy usage by 46 per cent by insulating, airsealing, improving heating system efficiency and lowering water and space heating temperatures.

Terry J. Hueston, Halifax

- Mr. Hueston, founder of Hueston Insulators, has consistently offered impartial advice and information to the public on energy conserving improvements to homes as part of his display booth at home shows and mall exhibits. He has volunteered many hours of personal time to serve on an advisory committee that guided the Halifax Community Retrofit Project.

Energy Engineering Section

A. Parker, Section Manager

INTRODUCTION

The Energy Project Engineering Section is responsible for the planning, execution and management of studies and projects related to energy management, fuel utilization and substitution, energy transmission and distribution and renewable energy resources. The Section provides engineering services for work carried out by other sections as well as assistance for long range planning and policy direction.

ACTIVITIES

The majority of staff time available during fiscal year 1986/87 was devoted to activities under the Canada/Nova Scotia Memorandum of Understanding on Conservation and Alternative Energy (MOU). Staff participated on all MOU Sub-Committees; members of the staff are co-chairpersons of the Renewables and Industrial/Commercial Sub-Committees. Projects developed and implemented for the renewable sector include a study on the potential of wood fired cogeneration, a study dealing with barriers to the use of biomass energy, a course for solar greenhouse instructors and a testing and demonstration project to utilize energy from flooded, abandoned mines in conjunction with heat pump technology.

The Industrial/Commercial sector projects include technology transfer, a waste heat recovery demonstration using a heat pump, and a diesel engine cogeneration study. In addition to the above projects for which the Section has prime responsibility, staff have also offered technical assistance in the areas of transportation and residential energy conservation.

During the year, an Interdepartmental Committee on the use of wood fuel in government owned or supported facilities was formed. This committee, which has members from the Department of Mines and Energy, Government Services, the Department of Lands and Forests and Policy Board, has met approximately once a month.

Section staff have provided pre-feasibility analysis for all sites being considered by the committee for wood fuel substitution. During the year, 65 sites were analysed using the computer program "ENVEST" and in-house computer facilities. Twenty-six of these sites were recommended for further study and staff prepared a priority list of these sites based on financial considerations.

In addition to biomass energy activities, resulting from the MOU, staff have worked on other wood fuel projects, including participation on the steering committee for the Wood Chip Development Project, in conjunction with the Nova Scotia Forest Products Association. This project has assisted two wood chip supply operations, produced two wood energy video tapes and was a major sponsor of Energy Opportunities 87, a wood fuel conference held in Halifax during February 1987.

The section also co-ordinated the province's participation in the establishment of a wood chip burning boiler at Britex Limited, Bridgetown, Annapolis County. This project was officially opened in August 1986. The Section also met with two industrial commissions in Nova Scotia to discuss wood fuel use and conducted a study to determine the feasibility of wood fuel

substitution at a Department of National Defence establishment on behalf of one of these commissions. A member of the Section accompanied the Select Committee of the Legislature on Forestry (Wood Chips and Biomass) on a trip to Sweden to investigate wood energy use in that country.

A study to determine the technical and financial viability of using diesel engines to cogenerate electrical and heat energy was undertaken during the year. This study, which will be completed shortly, analysed seven sites in Nova Scotia for the application of this technology. Initial results of the study are encouraging, with simple pay backs of from two to five years possible from the increased efficiency obtained from a cogeneration system.

Briefing material on wood energy, the economic impact of wood energy, energy from municipal waste and electricity generated from wood fuel, hydro plants and wind systems, was also prepared during the year.

Staff continue to monitor technology developments which could effect energy production and use in Nova Scotia. Information was collected and filed on biomass and coal combustion systems, on solar energy in the areas of solar heating and solar photovoltaic systems, and on wind energy systems.

Economics and Statistics Section

V. Harnish, Section Manager

INTRODUCTION

The Economics and Statistics Section evaluates and analyzes energy supply, demand and pricing issues arising from developments and policies of a provincial, national and international nature, and recommends appropriate responses. The Section also co-ordinates a comprehensive energy-planning program and is responsible for statistical reporting of energy supply and demand in Nova Scotia.

The Section prepares reports, position papers, publications and computer models and manages the preparation of studies by private consultants. Depending on the nature of the material, these studies are made available to other ministries, the public, energy corporations and other governments and agencies. The Section also prepares and co-ordinates submissions on behalf of the province to regulatory authorities such as the National Energy Board.

ACTIVITIES

The preparation of Nova Scotia's long term energy strategy was completed during fiscal year 1986/87 and the final report, *Energy Plan 1985: A Discussion Document,* was tabled in the House in May. The government of Nova Scotia intervened before the Board of Commissioners of Public Utilities during hearings regarding the issue of petroleum product pricing in the province. Section staff provided statistical and analytical support to legal and industry experts acting on behalf of the province before the Board in its deliberations. The Board relied heavily on evidence provided by the province in rendering its decision and its findings were in large part consistent with the position put forward by the province. The Board's decision to reduce product prices by 0.55 cents/gallon (2.5 cents/L) will mean substantial savings for Nova Scotia energy consumers, and the recommendations to deregulate the retail sector to some extent could translate into significant changes to the industry.

In its second year of development and use, the Section's Provincial Energy Demand Forecast Model has gone through a significant amount of reworking and refinement in order to improve the model's flexibility and internal consistency. The database has been updated to the latest year of data availability and the model adjusted to reflect this information. Through these improvements, it is anticipated that more accurate forecasts can be provided on a regular basis.

The Section also carried out considerable program evaluation work in conjunction with other department and interdepartmental staff. This included evaluations of the economic impact of energy management opportunities and the solar and wind sales tax rebate program.

The section also prepared much of the Department's submission for the government's Program Planning process, and the Section Manager represented the Department on the Natural Resources Working Group formed to make recommendations on long term planning priorities for the natural resources sector.

Reports and work of a shorter term nature included analysis of the effect of Canada-U.S. free trade discussions on Department programs; preparation of the provincial submission to the National Energy Board's natural gas surplus determination procedures hearing; and participation in a study of the economic impacts of wood chip utilization in Nova Scotia.

The considerable decline in crude oil prices that occurred during the first half of 1986 had a variety of far reaching implications. The Section analysed a number of issues in light of this decline including: the impact on refined petroleum product prices in Nova Scotia and other provinces; the implications

of a proposed U.S. crude oil import tariff; the evolving state of the Organization of Petroleum Exporting Countries (OPEC) market share; the outlook for offshore natural gas and oil development; and the impact on the Nova Scotia economy.

Section staff continued to monitor important policy and regulatory developments taking place in both Canadian and U.S. natural gas markets. In addition, staff prepared analyses concerning a number of competing proposals to supply western Canadian natural gas into northeast U.S. markets, and the potential impact this would have on the Venture Gas Project.

In addition to policy-oriented issues, statistical data was compiled, analyzed and presented on a regular basis. During the past year, staff have provided a monthly energy fact sheet containing data on supply, demand and pricing of coal, electricity and petroleum products and have printed the annual Energy Statistical Profile.

The Section completed the conversion of a number of computer programs, previously running on external computer systems, to operate on micro-computers within the Department. Several computer-based energy price forecasts were completed by staff, along with calculations of pipeline tariffs using a model which they developed.

One ongoing activity, scheduled for completion in the next fiscal year, is the revision and redrafting of the Pipelines and Gas Utilities Acts. This effort, undertaken in conjunction with counsel from the Attorney-General's Department, is necessary in light of the changing policies surrounding regulation of natural gas in Canada.

Energy Programs Section

J. Gordon, Section Manager

INTRODUCTION

The goal of the Energy Programs Section is to promote the efficient and appropriate use of energy within the province. This is achieved through the provision of various conservation and fuel substitution programs to all sectors of the economy.

Three main working groups comprise the Energy Programs Section; the Provincial Energy Analysis Program (PEAP), Residential Energy Programs and the Energy Education Program.

PEAP provides on-site energy analyses to provincial and municipal government facilities and to small businesses with individual energy bills of less than $10,000 per year. The program also provides follow-up technical advice on the implementation of energy management measures recommended by these analyses.

Residential Energy Programs provides information and motivational programs on residential energy use. This group is responsible for monitoring and addressing significant residential energy conservation issues, as well as assessing and surveying public attitudes toward energy. It also serves the public information needs of the Division by co-ordinating the production of technical and promotional printed material, audio-visuals and advertising.

The Energy Education Program carries out a variety of educational and outreach activities, often in co-operation with other departments, groups or associations.

RESIDENTIAL ENERGY PROGRAMS

Each year the Residential Energy Programs group receives thousands of requests from the public for advice and information. The Enerinfo phone line (1-424-5727) — a province-wide, toll free advisory service — accounted for 2,138 information requests during the fiscal year. Written requests, referrals from other agencies, responses to the section's promotional material and enquiries resulting from the Enerinfo display at home and energy trade shows also accounted for a significant volume of responses. Information provided ranged from the very general to extremely specific, and covered such topics as ventilation and moisture problems, heating systems, air sealing, new home construction and vehicle fuel economy.

The Residential Energy Programs group participates in major energy-related trade shows each year using the Enerinfo display. In addition, staff provide seminars on topics such as wood heating, air sealing, insulation, condensation and heating system upgrading. Staff also respond to requests for site inspections of homes with major problems. There were 91 inspections, followed by recommendations, during this fiscal year as well as inspections and recommendations to housing co-operatives in Halifax, Dartmouth, Lower Sackville and Liverpool. Staff also delivered a lecture on renovating for energy conservation at a seminar called *Adaptive Reuse of Older Buildings*, organized by the Technical University of Nova Scotia.

Residential Energy Programs also provided advice on energy conservation to other government departments and agencies. During fiscal year 1986/87, program staff were consulted by the Nova Scotia Department of Consumer

Affairs, Nova Scotia Department of Housing, Nova Scotia Department of Culture, Recreation and Fitness (heritage buildings), Nova Scotia Department of Development and the Nova Scotia Power Corporation for assistance on residential energy issues.

During 1986, staff produced a series of new publications called the *Energy Adviser.* Individual titles in this series were *How the Homes Uses Energy, Understanding Condensation in the Home, Draftproofing the Home, Heating with Oil,* and *Mechanical Ventilation Systems.* A revised *Home Heating Workbook* was also published.

During 1986/87, staff worked closely with other sections and with Energy, Mines and Resources Canada to implement energy-related programs and activities under the Transportation and Existing Housing sub-committees of the Canada/Nova Scotia Memorandum of Understanding on Conservation and Alternative Energy (MOU).

This included the delivery of 12 seminars to building supply and hardware store employees. Staff also organized several other initiatives funded under the MOU, including the "Public Housing Air Seal Project", to air seal 160 public housing units and train staff at four housing authorities in air leakage control; the "Escape Kit" advertising program, a radio and newspaper awareness campaign on housing and energy; and a study of consumer attitudes towards energy that was nearing completion at fiscal year-end.

Staff represent the Department on numerous committees, including those of the Canadian Wood Energy Institute, R-2000 Regional Steering Committee, Canadian General Standards Board's National Advisory Panel on Standards for Building Performance and the MOU Communications Sub-Committee.

Staff provided comprehensive information, printing and advertising services to the Division. This included design advice and assistance in the production of *Energy Plan 1985*, and brochures describing the *Canada/Nova Scotia Memorandum of Understanding on Conservation and Alternative Energy (MOU),* and the Northeast International Energy Committee's seminar on *Energy Policy and Planning During Oil Price Decline.*

ENERGY EDUCATION PROGRAM

The Energy Education Program creates an awareness of efficient energy use and appropriate fuel substitution among youth and educational audiences. The primary focus of the program has been in-class presentations to students in grades primary through twelve, supplemented by student and teacher resource materials.

During 1986/87, staff made 526 presentations to over 35,000 students in 175 schools. The number of student contacts remained constant while 18 additional schools were visited. Learning resource materials and student activity sheets for elementary school children were prepared and distributed.

Staff prepared energy resource materials of particular relevance to the supply and utilization of energy in Nova Scotia, which are planned for distribution in the upcoming year. This included a Nova Scotia Energy Calendar for junior high school classrooms, completed as part of the staff's participation on the provincial chapter of Society, Environment and Energy Development Studies (SEEDS).

PROVINCIAL ENERGY ANALYSIS PROGRAM

The Provincial Energy Analysis Program provides free, on-site, computer-based energy analysis to public buildings such as hospitals, schools, provincial facilities and municipal buildings. During 1986/87, energy analyses were also provided to small business buildings using less than $10,000 worth of energy annually.

During the period of April 1, 1986 to March 31, 1987, 348 energy analyses were conducted in buildings which had a combined annual energy bill of $8,166,000. Energy efficient improvements were identified in these buildings, which would reduce annual energy costs by $1,033,600 or 12.7 per cent. A summary of energy analysis results for fiscal year 1986/87 is provided in Table 10.

TABLE 10. Results of the Energy Analysis Program.

	Public Sector	Small Business	TOTAL
Audits	269	79	348
Total Energy Use ($)	7,475,181	690,933	8,166,114
Average Per Site ($)	27,789	8,746	23,466
Potential Savings Value ($)	903,604	130,052	1,033,656
Per cent Savings	12.1	18.8	12.7

Combined Program Potential Savings — 12.7%

Substantial post audit services to small business and government clients were also provided by staff. These services involved assisting with the costing

and planning of energy efficiency measures and providing technical information. Staff routinely surveyed clients in order to document energy conservation improvements and to evaluate the subsequent energy savings.

A number of additional energy advisory services, mainly related to the dissemination of energy management information, were provided by the program staff during the past fiscal year. Staff participated in the development and provision of a number of energy management seminars in co-operation with the Technical University of Nova Scotia and Energy, Mines and Resources Canada. Staff represented the department on the Nova Scotia Chapter of the Federal Commercial and Office Buildings Energy Management Task Force.

Program staff have been involved in drafting an energy cost reduction strategy for public buildings owned or funded by the province in conjunction with the Interdepartmental Committee on Building Energy Management. The new strategy will address a number of issues related to increasing energy management activity in public buildings. The objective of the strategy is to reduce energy costs while maintaining environmental quality within public buildings.

Provincial Energy Analysis Program staff were also involved in the evaluation of past energy audit and retrofit grant programs which were administered by the department in the early 1980s. Preliminary results of the economic impact analysis associated with the evaluation indicate that for each $1,000,000 of federal, provincial and private funds spent on energy retrofits under these energy programs, 70 person years of employment were generated in the private sector. This level of employment, in turn, generated $1.2 million of household income in Nova Scotia.

ADMINISTRATION DIVISION

C.R. James, CMA, Director

The Administration Division provides the Department with financial, operational, and personnel management. It also provides cartographic and administrative services to the Department and accounting services for Novaco Limited. The Director is Secretary-Treasurer of this crown corporation.

Under the Department Budgetary System, the Administration Division consists of the Offices of the Minister and Deputy Minister, Energy Branch Administration, Mines and Minerals Branch Administration, and the Administration Division.

The duties and functions of the Division are divided into four sections: Accounting Services, Mineral Taxation and Fiscal Planning, Personnel and Administration, and Cartography.

The Administration Division is responsible for mineral and petroleum resource revenue policy, the collection of mineral royalties and taxes, and for the management and evaluation of government-funded coal mine and coal miner assistance programs.

Accounting Services Section

Ken Faulkner, CMA, Section Manager

The Accounting Services Section provides managerial and financial accounting and performs statistical services for the Department.

The Section is responsible for maintaining and updating the computerized departmental accounting system which provides internal control by recording and reporting expenditures monthly. The Management Information System provides a monthly and year-to-date report of expenditures compared to the department budget. These reports are circulated to Section Managers monthly and contribute to the Department's success in maintaining expenditures within budget authority. Budgeting responsibility and administration for the Department is co-ordinated in this Section by providing historical background, financial information, and by providing interpretation assistance to Budget Managers.

Two Coal Miners' Assistance Programs, the DOSCO (1923) pension and the Independent Coal Miners' Pre-Retirement Leave Plan, are administered by the Department. As of March 31 1987, 35 former miners were receiving the DOSCO (1923) pension and 68 were receiving Pre-Retirement Leave benefits.

Mineral Taxation and Fiscal Planning Section

Blair McMullin, Section Manager

The Mineral Taxation and Fiscal Planning Section is responsible for resource revenue policy and administration of mineral royalty and tax legislation. This section administers the Coal Mine Investment Security Program.

The Section also provides accounting services for Novaco Limited, a provincial crown corporation.

MINERAL ROYALTIES AND TAXES

This section manages the royalty and tax provisions of the Mineral Resources and Gypsum Mining Income Tax Acts.

The revenue from royalties and taxes reported by the Department are shown for a 20-year period in Figure 12 and for the current fiscal year in Table 11.

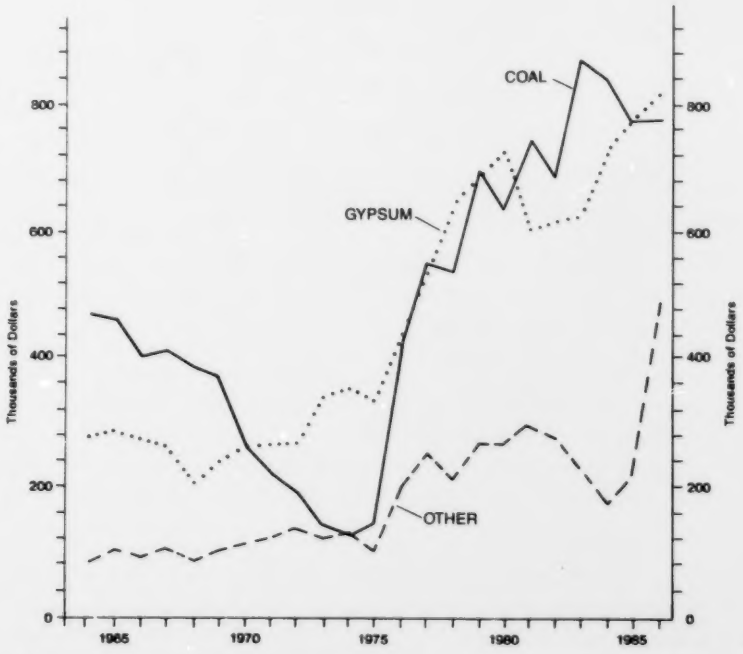


FIGURE 12. Historical trends of royalties and taxes.

TABLE 11. Royalties and taxes for the fiscal year ended March 31, 1987.

Commodity	Royalty or Tax
Gypsum	$ 816,698.51
Coal	778,671.40
Salt	207,716.52
Other	280,113.62
TOTAL	**$2,083,200.05**

COAL MINE INVESTMENT SECURITY PROGRAM

The Coal Mines Investment Security Program provides assistance to Evans Coal Mines Limited, St. Rose, Inverness County. The program is designed to promote self-sufficiency through operational efficiency and increased productivity. The operator is protected against major losses that could result from extended periods of low output.

NOVACO LIMITED

The Section administers the accounting control function of this crown corporation. Management information is provided on a monthly basis. During the year, Novaco's office was moved from 3 Elliot Street to 18 King Street, Sydney Mines, Nova Scotia.

Personnel and Administration Section

P. Edwards, Section Manager

This Section provides advice and support on personnel management to all divisions of the Department. The responsibilities of the Section include recruitment, staff relations, compensation, establishment and maintenance of performance appraisal systems, career development training, personnel and payroll documentation, and the maintenance of employee records. The Section is also responsible for the continual upgrading of office and administrative services for the Department.

The university student recruitment program provided summer employment for 70 students. Nine people were employed under the provincial Summer Employment Program.

During the year, the Section provided support by recruiting staff to work on programs related to the five-year Canada-Nova Scotia Mineral Development Agreement.

In consultation with the Department of Government Services and the Civil Service Commission, a computerized leave processing system was developed. The system is designed to record transactions which are associated with leave from the work place and to report on these transactions either through terminal or micro-computers, as well as ad-hoc reporting.

Throughout the year, meetings have continued with staff of the Civil Service Commission regarding the new classification system for bargaining unit positions.

Staff attended various in-service and external courses and programs covering areas such as management and supervisory development, communication skills, clerical/secretarial development, and occupational health and safety.

Personnel changes are shown in Table 12.

TABLE 12. Personnel changes during the 1986/87 fiscal year.

Appointments	**Separations**
Donald R. MacNeil	John Fraser
Shirley Ross	Rick Hornby
Allan Parker	Dave Davies
Nancy McIver	Lillian McKenna
Garth Prime	Jack Garnett
Andrew Wenning	Melissa Wolf
Nancy McInnis Leek	
Robert MacDonald	**TRANSFERS**
Lorraine MacCormac	Walter Fell
Douglas MacDonald	Katherine MacDonald
Peter Luke	Colin MacDonald
Sara Jane Snook	Jude Kelly
Robert Turner	David MacLean
Richard MacPherson	Albert McLean
Wilda Kaiser	Ralph Henwood
Douglas Engram	Fred Doucette
Barbara Kane	
Kenneth Northcote	
Ian MacLellan	
Paul Lombard	
Dick Potter	
RETIREMENTS	
Ian MacDougall	
Raymond Webster	
Watson MacLean	

Cartographic Section

Joe Campbell, Section Manager

The Cartographic Section's responsibility is to provide drafting and photographic services to all sections of the Department. During the past year, a wide variety of geological and energy-related drawings were produced for use in publications and visual displays.

Slides for audio-visual presentations as well as photographs for graphic displays were reproduced by the photographic unit. This unit was also required to provide field photography for several divisions of the Department.

As in the previous year, two drafting technicians were hired through the Canada-Nova Scotia Mineral Development Agreement.

FINANCIAL INFORMATION

The Department of Mines and Energy had 183 people on staff as of March 31, 1987. During the 1986/87 fiscal year, the Department administered expenditures of $12,336,200 while recovering $2,042,900 from various funds. Royalties and mining taxes as reported in Table 13 were $2,125,000, and the licences and fees were $671,000 for total revenue of $2,796,000.

Expenditure information is presented in Table 13 under three headings. "Operations and Assistance" are budgeted in the Department. "Other" includes expenditures budgeted under a Public Service Vote, and in the Department of Development.

"Operations information" is presented by budget subject title by division.

"Assistance information" is presented by budget subject title under two sectors: Coal Industry and Energy.

"Other" is presented by the legislative vote title or the department where the funds have been budgeted.

As the expenditure information provided was drawn from the publications *Estimates of the Government of Nova Scotia* and *Public Accounts of the Province of Nova Scotia,* the subject titles may differ from the sectional titles drawn from the Department Organization Chart.

TABLE 13. Financial information about the Department of Mines and Energy.

Division Activity Budget Subject Title	Actual Expenditure 1985-86	Estimate 1986-87	Final Forecast 1986-87
OPERATIONS			
ADMINISTRATION DIVISION			
1. Office of the Minister and Deputy Minister	$ 435,778	$ 429,800	$ 375,600
2. Accounting, Personnel and Administration	441,879	498,000	475,700
3. Cartographic Services	290,117	291,100	272,100
4. Energy Branch Administration	348,568	340,800	258,700

TABLE 13. Continued

Division Activity Budget Subject Title	Actual Expenditure 1985-86	Estimate 1986-87	Final Forecast 1986-87
5. Mines and Minerals Branch Administration	383,923	380,500	376,000
LESS: CHARGEABLE	(262,442)	—	—
TOTAL Administration Division	$1,637,823	$1,940,200	$1,758,100
ENERGY MANAGEMENT DIVISION			
1. Provincial Energy Analysis	$ 450,204	$ 443,800	$ 388,400
2. Energy Planning & Statistics	374,906	616,500	427,800
3. Energy Advisory Services	349,678	381,400	361,400
4. Energy Engineering	137,206	175,500	205,600
5. National Conservation and Alternative Energy Initiatives	—	1,005,000	573,300
LESS: CHARGEABLE	(292,537)	—	—
TOTAL Energy Management Division	$1,019,457	$2,622,200	$1,956,500
ENERGY RESOURCES DIVISION			
1. Petroleum Resources	$ 449,509	$ 536,200	$ 443,000
2. Coal Exploration	227,562	280,900	236,400
3. Peatlands Inventory	114,771	—	—
4. Coal Development and Utilization	149,984	158,600	154,800
LESS: CHARGEABLE	(421,079)	—	—
TOTAL Energy Resources Division	$ 520,747	$ 975,700	$ 834,200
DRILL AND MECHANICAL DIVISION			
1. Drilling Services	$ 596,146	$ 570,300	$ 563,400
2. Operations & Maintenance	292,115	295,700	257,000

TABLE 13. Continued

Division Activity Budget Subject Title	Actual Expenditure 1985-86	Estimate 1986-87	Final Forecast 1986-87
TOTAL Drill and Mechanical Division	$ 888,261	$ 866,000	$ 820,400
MINING ENGINEERING DIVISION			
1. Mining Engineering	$ 188,743	$ 197,200	$ 203,600
2. Mine Safety and Inspection	478,696	A	A
TOTAL Mining Engineering Division	$ 667,439	$ 197,200	$ 203,600
MINERAL RESOURCES DIVISION			
1. Mineral Resource Evaluation	$ 213,857	$ 218,100	$ 222,300
2. Regional Surveys	281,108	305,100	309,000
TOTAL Mineral Resources Division	$ 494,965	$ 523,200	$ 531,300
MINERAL DEVELOPMENT DIVISION			
1. Resource Geology	$ 132,123	$ 137,800	$ 140,900
2. Regional Exploration Services	207,727	199,300	212,600
3. Library Services	135,975	169,600	168,000
4. Mineral & Petroleum Titles	98,565	98,600	100,200
TOTAL Mineral Development Division	$ 574,390	$ 605,300	$ 621,700
TOTAL OPERATIONS	$5,803,082	$7,729,800	$6,725,800
ASSISTANCE PROGRAMS			
COAL INDUSTRY ASSISTANCE			
1. Coal Miners' Assistance	$ 470,052	$ 485,000	$ 422,500
2. Coal Development — Novaco	75,000	75,000	75,000

TABLE 13. Continued

Division Activity Budget Subject Title	Actual Expenditure 1985-86	Estimate 1986-87	Final Forecast 1986-87
3. Coal Mines Subsidy Program	253,805	—	—
4. Coal Mines Investment Security Program	—	160,000	160,000
TOTAL Coal Industry Assistance	$ 798,857	$ 720,000	$ 657,500
ENERGY ASSISTANCE			
1. Coal Liquefaction	$ 249,458	$ 250,000	$ 250,000
2. Oil Substitution	2,183,928	3,885,500	1,202,900
TOTAL Energy Assistance	$2,433,386	$4,135,500	$1,452,900
TOTAL ASSISTANCE	$3,232,243	$4,855,500	$2,110,400
OTHER PROGRAMS			
OTHER			
1. Power Rate Assistance Budgeted as a Public Service Vote	$38,482,365	0	0
2. Energy and Mineral Subsidiary Agreements Budgeted in Department of Development	1,831,588	3,000,000	3,500,000
TOTAL OTHER	$40,313,953	$ 3,000,000	$ 3,500,000
TOTAL EXPENDITURES ADMINISTERED BY DEPARTMENT OF MINES AND ENERGY	$49,349,278	$15,585,300	$12,336,200

A — Program transferred to the Department of Labour.

LEGISLATION

INTRODUCTION

The Nova Scotia Department of Mines and Energy receives its mandate from the Public Service Act. This act provides for a Department of Mines and Energy and the appointment of a Deputy Minister. It also provides for the function of the Department and its employees.

The following acts are administered by the Department of Mines and Energy. At the end of the fiscal year, administration of the Coal Miner Regulation Act and Metalliferous Mines and Quarries Act will be transferred to the Department of Labour and Manpower.

Mineral Resources Act S.N.S. 1975, c.12.

The Mineral Resources Act regulates mineral exploration and development and the disposition of mineral rights as well as administrative procedures, resources management requirements, and royalties. Stone, sand, gravel, peat, gypsum, non-crown limestone, oil, gas and oil shale fall outside the act. Coal, salt, potash, and uranium may only be worked under license by Order of the Governor in Council. There is a moratorium on all uranium exploration activity in the province.

Treasure Trove Act R.S.N.S. 1967, c.314.

The Treasure Trove Act regulates the exploration for precious stones and metals in a state other than their natural state. Forms for exploration and royalties are provided by Order of the Governor in Council.

Coal Mines Regulation Act R.S.N.S. 1967, c.36.

The Coal Mines Regulation Act governs operation and safety in provincial coal mines. Coal mines operated by the federal government through crown corporations, such as the Cape Breton Development Corporation, are inspected and regulated under the Canada Labour Code. Provincial coal mines are inspected by the Nova Scotia Department of Labour.

Gas Storage Exploration Act S.N.S. 1970, c.6

The Gas Storage Exploration Act governs exploration and development of underground storage of liquid or gaseous petroleum products.

Metalliferous Mines and Quarries Act R.S.N.S. 1967, c.183.

The Metalliferous Mines and Quarries Act governs operation and safety in mines and quarries that are not otherwise covered by the Coal Mines Regulation Act. Quarries operated by the Department of Transportation do not fall under this act. Inspections are performed by the Nova Scotia Department of Labour.

Gypsum Mining Income Tax Act R.S.N.S. 1967, c.122

The Gypsum Mining Income Tax provides for reporting procedures and mining tax formulae for gypsum mining operations in the province.

An Act to Confer Certain Powers Upon the Lieutenant Governor in Council and to Amend the Mines Act S.N.S. 1918, c.16

Certain powers are conferred on the Lieutenant Governor in Council for the purpose of maintaining an acceptable level of stability in the Coal Mining Industry. The act provides authority for a subvention program for independent coal mine operators, a pre-retirement leave program, coal waste dumps reclamation project, and operation of Novaco Limited.

Petroleum Resources Act S.N.S. 1980, c.12.

The Petroleum Resources Act came into force July 28, 1984 and it regulates the administration and distribution of petroleum rights in Nova Scotia.

Energy and Mineral Resources Conservation Act S.N.S. 1980, c.5.

The Energy and Mineral Resources Conservation Act provides authority to establish an Energy Board to hear matters arising out of such acts as the Gas Utilities Act, Pipeline Act, etc. By amendment (S.N.S. 1984, c.60) the Governor in Council may amend the application of this Act and may designate the Public Utilities Board of Commissioners as the Energy Board. This act and the amendment came into force July 28, 1984.

Gas Utilities Act S.N.S. 1980, c.7.

The Gas Utilities Act regulates the process wherein an applicant may seek and obtain approval to operate a gas utility. By amendment (S.N.S. 1984, c.61) the act may be limited to certain geographic areas and certain operations. The act and amendment came into force July 28, 1984.

Pipeline Act S.N.S. 1980, c.13.

The Pipeline Act regulates all aspects of the transmission of oil and gas. The act may be limited to certain transmission lines and certain geographic areas as provided for in S.N.S. 1984, c.65. The act and amendment came into force July 28, 1984.

Canada-Nova Scotia Oil and Gas Agreement Act S.N.S. 1984, c.12.

The Canada-Nova Scotia Oil and Gas Agreement Act mirrors federal legislation implementing and giving effect to the Canada-Nova Scotia Agreement on Offshore Oil and Gas Resources Management, as well as revenue sharing which provides the framework for administration and regulation of offshore oil and gas exploration and production.

Offshore Oil and Gas Act S.N.S. 1984, c.8.

The Offshore Oil and Gas Act is another, of the offshore legislation package. This act, along with the federal counterpart, regulates acquisition and disposition of offshore oil and gas rights. Crown share, Canadian ownership rates, transfers, and other matters are also addressed.

Oil and Gas Production and Conservation (Nova Scotia) Act S.N.S. 1984, c.9.

Exploration, drilling, development, and production of oil and gas in the offshore are regulated by the Oil and Gas Production and Conservation (Nova Scotia) Act, and its federal counterpart.

APPENDIX A

PUBLICATIONS

INFORMATION CIRCULARS

No. 1	Directory of goods and services for exploration companies; Nova Scotia Department of Mines and Energy, February 1986.	FREE
No. 2	Mineral rights, landowners and mineral exploration; Nova Scotia Department of Mines and Energy, February 1986.	FREE
No. 3	A walking tour of rocks, minerals and building stones in downtown Halifax; Nova Scotia Department of Mines and Energy, April 1986	FREE
No. 4	Nova Scotia gold; Nova Scotia Department of Mines and Energy, May 1986.	FREE
No. 7	A walking tour of rocks, minerals and land forms of Point Pleasant Park; Nova Scotia Department of Mines and Energy, June 1986.	FREE

INFORMATION SERIES

No. 10	Petroleum Wells & Drill Holes With Petroleum Significance, Onshore Nova Scotia, compiled by P. McMahon, G. Short, and D. Waler, January 1986, 194 pages. (Microfiche $2.00)	$10.00
No. 11	Surface Petroleum Shows, Onshore Nova Scotia, compiled by Gayle Short, March 1986, 33 pages. (Microfiche $1.00)	$5.00
No. 12	Program and Summaries, Tenth Annual Open House and Review of Activities, by Nova Scotia Department of Mines and Energy, 1986, 205 pages. (Microfiche $2.00)	$5.00

PAPERS

Paper 86-1	Cretaceous Deposits of Nova Scotia, by G. B. Dickie, 1987, 54 p. (Microfiche: $3.00)	$15.00

REPORTS

Report 86-1	Mines and Minerals Branch, Report of Activities, 1985, 374 p. (Microfiche: $3.50)	$12.00
Report 86-2	Index to Assessment Reports 1981-1985 (with Keyword and Map Indexes), by Norman A. Lyttle, Janet Gillespie-Wood, Gary M. Frotten and Mary Jean Fraser-MacKinnon, 178 pages. (Microfiche: $8.00)	$20.00
Report 86-3	Drilling Logs of Government Core Drills, 1985, compiled by I. MacDougall and D. E. Polly, 1986, 21 pages. (Microfiche: $2.00)	$3.50
Report 86-4	Index to Publications, Open File Reports, Open File Maps and Theses 1981-1985 (with Keyword and Map Indexes), by N. A. Lyttle, J. Gillespie-Wood, D. R. MacDonald and D. B. Hopper, 647 pages. (Microfiche: $10.00)	$25.00

MAPS

Map 86-1	Geological Map of the Sydney Basin, Cape Breton Island, Nova Scotia; R. C. Boehner and P. S. Giles, 1986; scale 1:50 000.	$5.00
Map 86-2	Geological Map of the Windsor Area, Nova Scotia, by Reginald G. Moore and Stewart A. Ferguson, 1986; scale 1:25 000.	$5.00

REPRINTS

Reprint 86-1	The Petrology, Geochemistry, and Economic Potential of the Musquodoboit Batholith, Nova Scotia, by M. A. MacDonald and D. B. Clarke; in Canadian Journal of Earth Sciences, v.22, 1985, p. 1633-1642. (Microfiche $1.00)	$1.50
Reprint 86-2	Upper Carboniferous Strata of the Tatamagouche Syncline Cumberland Basin, Nova Scotia, by R. J. Ryan; in Current Research, Part B, Geological Survey of Canada, Paper 85-1B, p. 481-490, 1985. (Microfiche $1.00)	$2.00

Reprint 86-3	Review of some chemical and mineralogical characteristics of granitoid rocks hosting Sn, W, U, Mo deposits in Newfoundland and Nova Scotia, by A. K. Chatterjee and D. F. Strong. (No Microfiche)	$2.00

OPEN FILE REPORTS

OFR 86-025	The Gypsum industry in Nova Scotia — Present status and future prospects, by R. E. Wright and J. H. Brown; prepared for Nova Scotia Department of Mines and Energy by Center for Resource Studies, Queen's University, 1985, 125 pages.	$15.00
OFR 86-039	Agricultural gypsum project, by Peter Luke, 1986, 9 pages.	$3.00
OFR 86-054	The U.K. experience on the effects of offshore sand and gravel extraction on coastal erosion and the fishing industry, by R. Warren Drinnan and Douglas G. Bliss, Dobrocky Sea Tech Limited, August 1986, 90 p.	$10.00

OPEN FILE MAPS

OFM 86-049 to OFM 86-056	Gold compilation of the Meguma Terrane in Nova Scotia, by J. McMullin, G. Richardson, T. Goodwin, 8 maps, scale 1:100 000. (Copies available from Precision Microfilming Services Ltd., 6100 Young Street, Halifax, N.S., B3K 2A4, (902) 455-5451.	

MISCELLANEOUS

Oil and Gas Exploration in Nova Scotia	FREE
Energy Plan 1985	FREE
How the Home Uses Energy	FREE
Understanding Condensation in the Home	FREE
Heating with Oil	FREE
Draftproofing the Home	FREE
Mechanical Ventilation Systems	FREE

The Canada-Nova Scotia Memorandum of Understanding on Conservation and Alternate Energy	FREE

APPENDIX B

MINERAL PRODUCTION INFORMATION

The mining industry in Nova Scotia directly employed more than 5,800 people (Fig. B-1). The value of the materials produced was in excess of $388 million (Fig. B-2). The increased value of mineral commodities produced in Nova Scotia since 1981 is shown in Figure B-3.

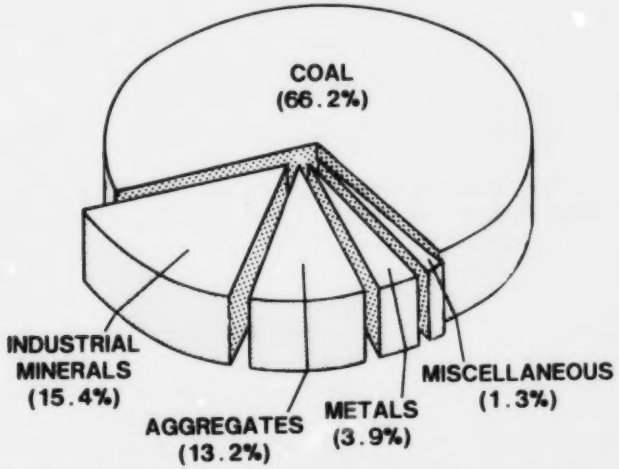


FIGURE B-1. Employment by mineral commodity as a percentage of the total employment (5827)

In this appendix, each production site is described and located. Tables B-1 to B-5 summarize the production figures for each commodity or mineral and are found at the end of Appendix B. Site locations are shown on the accompanying maps, Figures B-4 to B-6. Production data are for the calendar year January 1, 1986 to December 31, 1986.

METAL MINES AND GOLD MINES

No gold mine production was recorded in 1986; however, there is increased activity and gold production is expected to recommence in 1987 or early 1988.

Tin

The province's sole base metal producer, owned by East Kemptville Tin Corporation, began milling ore in October 1985, as detailed below. The location is shown on Figure B-4 and production in Table B-1.

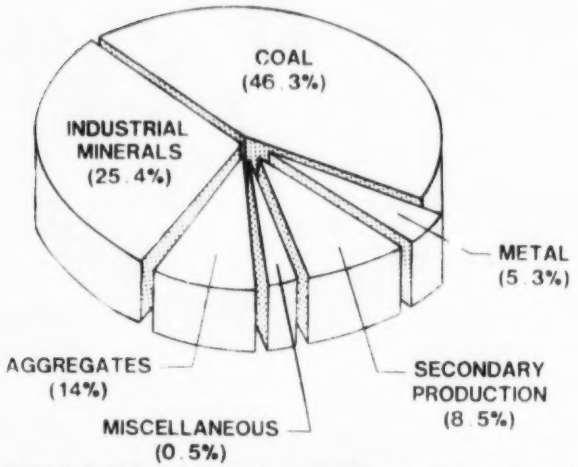


FIGURE B-2. Value of mineral commodity groups as a percentage of the total mineral production ($ 388.6 million)

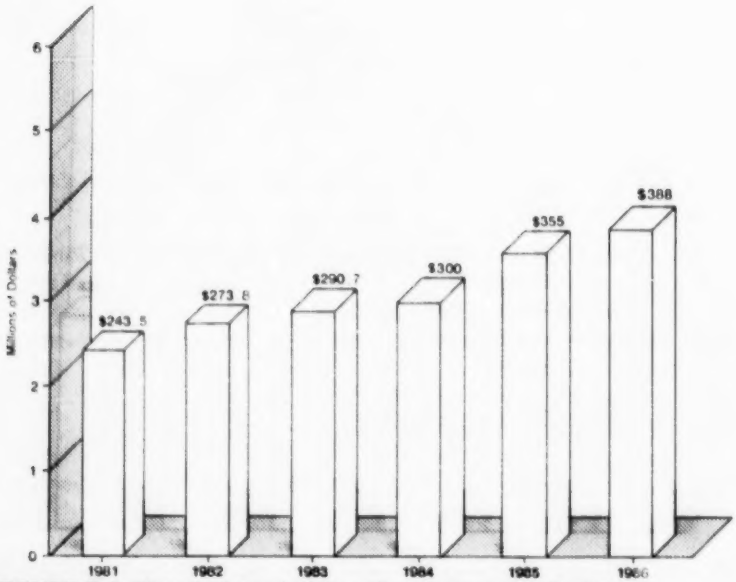


FIGURE B-3. Historical trend of the value of unprocessed mineral production

EAST KEMPTVILLE TIN CORPORATION

Manager: K. Collison, P.Eng.
Address: P.O. Box 6, East Kemptville, N.S. B0W 1Y0
Production: 5,254.1 ton (4 766.5 t) tin concentrate

The concentrator started milling ore in October, 1985. During the same month, the International Tin Council announced that it would not be able to meet its financial obligations. The price of tin dropped to about half of its September value. In November of 1986, Rio Algom Ltd. announced a decision to end its financial obligations to the East Kemptville project. Ownership of the mine was handed over to the banks that had financed the project.

The trouble with the amount of clay in the ore, which had caused settling problems in the tailings pond, has been overcome.

The mining rate is in the order of 9 000 tonnes/day. Annual output of metals contained in concentrates for 1987 and beyond is expected to be 4,850 tons (4 400 t) of tin, 2,650 tons (2 400 t) of zinc and 1,650 tons (1 500 t) of copper.

COAL MINING OPERATIONS

At the beginning of 1986 there were three underground coal mines, three open pit mines and three coal dump reclamation plants in operation. Table B-2 summarizes production information for the coal mines. The location of these operations is shown in Figure B-4.

Underground Coal Mines

EVANS COAL MINES LTD.

Manager: G. Evans
Address: R.R. #1, Inverness, N. S. B0E 1N0
Production: 38,890 tons (35 281 t) coal
Employees: 45

The St. Rose Colliery, Inverness County, is owned and operated by Evans Coal Mines Ltd. The entire production is either from development headings or by room and pillar mining, followed by pillar recovery.

As part of the modernization program, the company purchased a Westfalia Lunen Fuchs boom cutter loader continuous mining machine to aid in

development of the mine. The company also instituted a roof-bolting ground support system.

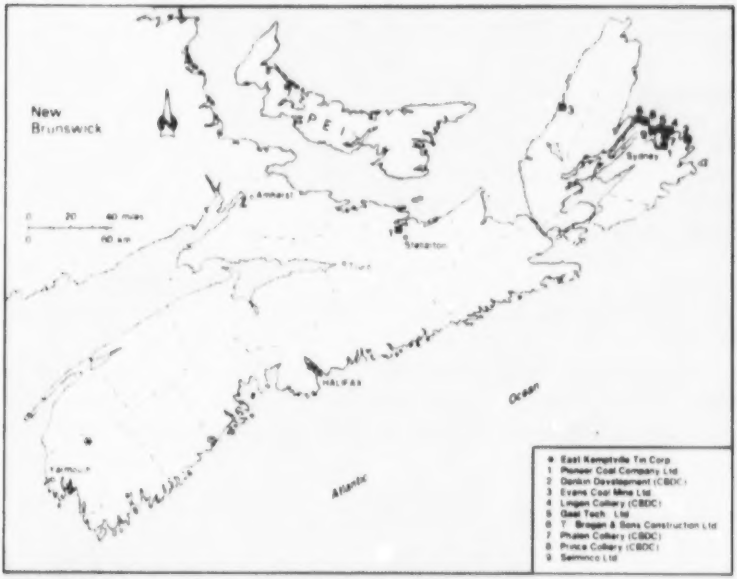


FIGURE B-4. Locations of metal mines and coal mines

The program to rehabilitate and modernize the mine, which was funded by a $1.5 million grant from the federal government, is now complete.

CAPE BRETON DEVELOPMENT CORPORATION

Manager:	Robert Cooper, P.Eng. Vice President, Mining Operations
Address:	P. O. Box 2500, Sydney, N. S. B1P 6K9
Production:	2,659,846 tons (2 412 997 t) coal
Employees:	3,624

The Cape Breton Development Corporation (CBDC) is a federal crown corporation that operates two producing underground coal mines in the province. The Corporation has two additional underground mines under development near Lingan and Donkin.

Production has been seriously affected by the closure of No. 26 Colliery last year following a fire.

LINGAN COLLIERY (Harbour Seam)

This mine is located at Lingan near New Waterford. Coal is recovered by fully mechanical advancing longwall faces.

Longwall faces 6W and 9E operated all year. Longwall 10E started production on April 7. Development work was carried out to prepare walls 7W and 11E.

PRINCE COLLIERY

This mine is located at Point Aconi. The coal is extracted by fully mechanical retreating shortwall faces. Extraction was completed on the 4 West face on April 27 and on the 6 East face on October 6, while 5 West face operated all year. The development work is complete to establish face 6 West, and development work is underway to establish 8 East. Work driving the main slopes continued.

Mines Under Development

PHALEN COLLIERY

The Phalen Colliery, a retreating longwall mine, will be in production by the Spring of 1987.

Development work continued during 1986. The undercast to the air shaft was completed and development continued on the main slopes and on No. 1 East and No. 1 West panels.

DONKIN-MORIEN DEVELOPMENT

The tunnel boring machine was installed in No. 3 tunnel. By year end, work on this tunnel was near completion.

Surface Coal Mines

PIONEER COAL CO.

Manager:	D. Clifton
Address:	P.O. Box 929, Westville, N. S. B0K 2A0
Production:	119,526 tons (108 433 t) coal
Employees:	14

The open pit mining of the Acadia and Scott Seams crown pillars has continued.

PIONEER COAL CO.

Address:	Reserve, Cape Breton County
Production:	16,361 tons (14 843 t) coal
Employees:	16

This is a new surface mine. The coal is mined by Pioneer Coal Company on a CBDC sublease. Coal is mined mainly from the Gardiner seam. Coal will be mined from the O'Dell seam if quality specifications are met. The operation includes a 100 ton/hr. (90 t/hr.) heavy media wash plant.

T. BROGAN & SONS CONSTRUCTION LTD.

Manager:	T. Brogan
Address:	P.O. Box 199, Florence, N. S. B0C 1J0
Production:	37,920 tons (34 401 t) coal
Employees:	16

An open pit coal mine is operated at Point Aconi, Cape Breton County, by this company. The overburden is removed by a dragline excavator, and the exposed coal is ripped with a bulldozer and loaded into trucks with a front-end loader.

Coal Reclamation Plants

SELMINCO INC.

Manager:	D. Frederickson
Address:	P.O. Box 189, New Waterford, N. S. B1H 4N9
Production:	136,478 tons (123 812 t) reclaimed coal
Employees:	30

The company operates two reclamation plants. One reclaims coal from the Prince Mine Dump at Sydney Mines. The other is reclaiming coal from the dump at Scotstown, near New Waterford.

GAEL TECH INC.

Manager:	Tony Fisher
Production:	32,947 tons (29 889 t) reclaimed coal
Employees:	30

This company has a plant to reclaim coal from the fines previously produced by the Sydney Mines Wash Plant.

INDUSTRIAL MINERALS MINING

Industrial minerals form a significant part of the total mineral production in Nova Scotia. Eighteen industrial mineral producers operating at 27 sites produce gypsum, salt, anhydrite, stone, limestone, barite, dolomite, clay and shale, dimension silica sand, peat, and stone. The locations of these mines or quarries is shown on Figure B-5. Table B-3 summarizes production information. Additional information about secondary manufacturing is given in Table B-4.

The province's numerous aggregate producers operating in both granular and bedrock deposits supply all provincial requirements; two companies, Construction Aggregate Limited and Permanent Concrete Ltd., supply aggregate to the expanding export market.

Gypsum and Anhydrite

CANADA CEMENT LAFARGE LTD.

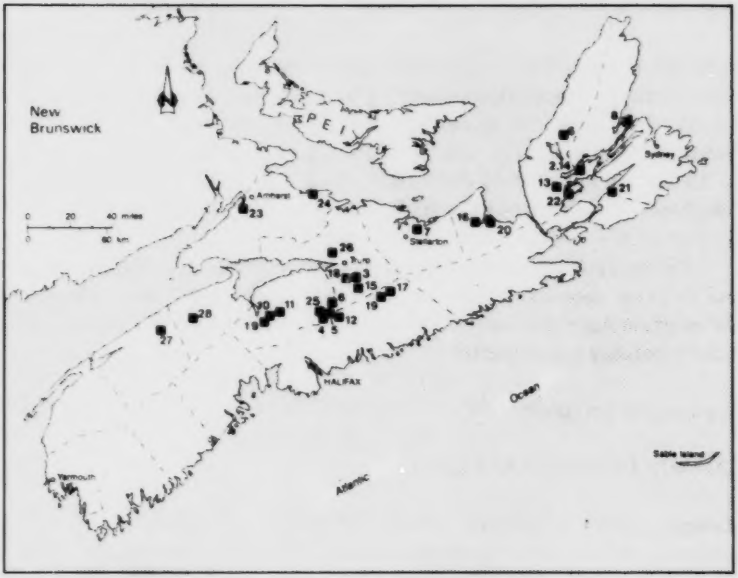
Manager:	D. King
Address:	P.O. Box 5, Brookfield, N. S. B0N 1C0
Production:	2,588 tons (2 348 t) gypsum
Employees:	See under Limestone

This small quarry is located just east of Brookfield and operates only to supply the needs of the company's cement plant.

DOMTAR CONSTRUCTION MATERIALS LTD.

Manager:	S. G. Johnson
Address:	P.O. Box 758, Windsor, N. S. B0N 2T0
Production:	11,968 tons (10 857 t) gypsum products
Employees:	12

Domtar Construction Materials reached its highest level of production since 1977 from the quarry at MacKay Settlement. The company installed additional dust collectors at its calcining plant in Windsor to further reduce dust emissions. This is the only operation in the province that undertakes processing of crude gypsum.



ANHYDRITE
1. Fundy Gypsum Co. Ltd.
2. Little Narrows Gypsum Co. Ltd.

BARITE
3. Nystone Chemicals Ltd.

CLAY AND SHALE
4-7. L.E. Shaw Ltd.

DOLOMITE
8. Scotia Limestone Ltd.

GYPSUM
9-10. Fundy Gypsum Co. Ltd.
11. Domtar Construction Materials
12. National Gypsum Canada Ltd.
13. Georgia Pacific Corp., Bestwall Division
14. Little Narrows Gypsum Company Ltd.
15. Canada Cement Lafarge Ltd.
16. Nova Construction Ltd.
17. Mosher Limestone Ltd.

LIMESTONE
18. Canada Cement Lafarge Ltd.
19. Mosher Limestone Ltd.
20. Ridge Brokers Ltd.
21. Scotia Limestone Ltd.
22. Nova Scotia Sand and Gravel Ltd. (marble)

SALT
23. Sifto Salt Division, Domtar Chemical Group
24. Canadian Salt Company Ltd.

SILICA SAND
25-26. Nova Scotia Sand and Gravel Ltd.

STONE
27. Heritage Memorials Ltd.

PEAT MOSS
28. Annapolis Valley Peat Moss Co.

FIGURE B-5. Locations of industrial minerals, dimension stone and peat moss operations

FUNDY GYPSUM CO. LTD.

Manager:	G. Raymond
Address:	P.O. Box 400, Windsor, N. S. B0N 2T0
Production:	84,523 tons (76 679 t) anhydrite
	1,660,630 tons (1 506 514 t) gypsum
Employees:	200

Fundy Gypsum produced both anhydrite and gypsum from two separate quarries at Wentworth and Miller Creek near Windsor. Both products are transported by rail to shiploading facilities in Hantsport for shipment to a variety of destinations.

GEORGIA PACIFIC CORPORATION

Manager:	J. Graham
Address:	P.O. Box 400, Port Hawkesbury, N. S. B0E 2V0
Production:	917,391 tons (832 252 t) gypsum
Employees:	57

Production by Georgia Pacific was somewhat lower than the record levels in 1985 at its River Denys operation, 982,904 tons (891 691 t) in 1985. Development work continued on the Sugar Camp deposit, the site of Georgia Pacific's future quarry. Present plans are for production to begin in 1987. Gypsum is transported by rail to dockside at Port Hastings, where company-owned vessels transport the gypsum to the United States.

LITTLE NARROWS GYPSUM COMPANY LTD.

Manager;	T. H. Davis, P.Eng.
Address:	Little Narrows, N. S. B0E 1T0
Production:	83,004 tons (75 301 t) anhydrite
	1,083,619 tons (983 053 t) gypsum
Employees:	101

Little Narrows Gypsum reached its highest level of production since 1979. The new Norman MacAulay quarry is now producing. This quarry will eventually become Little Narrow's main producing quarry. Both anhydrite and gypsum are produced and shipped from the company's dock on St. Patrick's Channels in the Bras d'Or Lakes, to various destinations in Canada and the United States.

NATIONAL GYPSUM (CANADA) LTD.

Manager:	P. Mills, P.Eng.
Address:	P.O. Box 637, Dartmouth, N. S. B2Y 3Y9
Production:	3,135,608 tons (2 844 605 t) gypsum
Employees:	119

National Gypsum operates the largest gypsum quarry in the province at East Milford, which is also the single largest gypsum quarry in the western world. National Gypsum set a new annual production record in 1986, with tonnages up slightly over those of 1985. The company transports the gypsum by rail from

Milford to Wright's Cove, where it is loaded on ships bound for various points in Canada and the United States. A program to refurbish the Wright's Cove loading facility was completed this year, with the removal of the 30-year-old overhead stacker and installation of a new articulated ore stacker.

Salt

CANADIAN SALT CO. LTD.

Manager:	Wm. McCormick
Address:	P.O. Box 160, Pugwash, N. S. B0K 1L0
Production:	982,374 tons (891 204 t) salt
Employees:	191

The Canadian Salt Co. mine is located in Pugwash, Cumberland County. A room and pillar system of extraction is employed utilizing trackless diesel and electric equipment. The processing plant on-site produces industrial grades of salt, blocks for farm use and refined salt for domestic consumption. The industrial grades are either supplied in bulk for truck transportation, bagged for rail transportation or transported in bulk or bags to storage and shiploading facilities at the Pugwash Harbour wharf.

Development work was begun for the 1,000 foot (305 m) level. This level is expected to be in production by 1988.

DOMTAR CHEMICALS GROUP, SIFTO SALT DIVISION

Manager:	R. E. Simmie
Address:	P.O. Box 550, Amherst, N. S. B4H 4A1
Production:	72,604 tons (65 866 t) salt
Employees:	98

Domtar Chemicals Group, Sifto Salt Division, operates a solution salt mine located near Nappan, Cumberland County. The mining procedure involves drilling a bore hole into the underground salt deposit. Water is pumped down to the deposit,where it dissolves the salt, forming brine. The brine is then forced back to the surface, where the salt is extracted using the "vacuum pan" process.

Barite

NYSTONE CHEMICALS LTD.

Manager:	V. Prostak
Address:	P.O. Box 64, Debert, N. S. B0M 1G0
Production:	3,727 tons (3 381 t) ore mined
Employees:	10

The barite ore is mined, crushed and jigged by a contractor at the company's mine site northeast of Brookfield, Colchester County. This produces a primary concentrate that is shipped to the company's plant at Debert, where it is upgraded in a pharmaceutical product.

In November of 1985, the hourly paid employees went on strike. The strike continued through 1986. Production is being maintained by staff and some hourly paid employees who have crossed the picket line.

SCOTSVILLE MINERAL RESOURCES LTD.

Owner:	R. S. Patterson
Address:	1000 MicMac Blvd., Dartmouth, N.S. B3A 4M7

This company established a small barite mine at Scotsville, Inverness County. Due to cash liquidity problems, the company was placed in receivership in June of 1986. Approximately 9,400 tons (8 500 t) of ore was mined prior to this action. An estimated 86,000 tons (78 000 t) of barite ore (65% $BaSO_4$) remain in situ in the open pit.

Limestone and Dolomite

CANADA CEMENT LAFARGE LTD.

Manager:	D. King
Address:	P.O. Box 5, Brookfield, N. S. B0N 1C0
Production:	483,968 tons (439 053 t) limestone
Employees:	18 (Quarry)
	71 (Cement Plant)

Canada Cement Lafarge Ltd. operates a limestone quarry and plant at Brookfield, Colchester County. The total production from the quarry is processed at the on-site cement manufacturing plant owned and operated by the company.

The plant operated well below its rated capacity due to the current economic conditions. The output of Portland Cement from the plant was approximately 220,000 tons (200 000 t). Additional information about cement production is given in Table B-6.

MOSHER LIMESTONE LTD.

Manager:	R. Mosher
Address:	P.O. Box 28, Upper Musquodoboit, N.S. B0N 2M0
Production:	98,816 tons (89 645 t) limestone
Employees:	29

Mosher Limestone operates two quarries in the Upper Musquodoboit area and one near Cooks Brook, Halifax County. The company produces an agricultural-grade dolomite and limestone. When processed, the product is supplied in bulk or bagged for wide distribution throughout the Atlantic Provinces as a soil conditioner.

RIDGE BROKERS LTD.

Manager:	A. Alward
Address:	P.O. Box 59, Havelock, N. B. E0A 1W0
Production:	16,534 tons (15 000 t) limestone
Employees:	7

The company operates a small limestone quarry at South Side, Antigonish Harbour, Antigonish County.

SCOTIA LIMESTONE LTD.

Manager:	J. D. Coffin
Address:	P.O. Box 457, Sydney, N. S. B1P 6H4
Production:	Nil
Employees:	6

Production of limestone from the Irish Cove deposit ceased with exhaustion of the deposit. No dolomite was produced from the Kelly Cove deposit in 1986. Mosher Limestone has been contracted to work the Kelly Cove quarry to produce agricultural-grade dolomite, aggregate and limestone for Sydney Steel and the filler market. Production from Kelly Cove is expected to begin early in 1987.

Clay, Shale, Industrial Sand, Marble

L. E. SHAW LTD. (NOVA SCOTIA SAND AND GRAVEL)

President:	A. Shaw
Address:	5251 Duke Street, Halifax, N.S. B3J 1P3
Production:	49,493 tons (44 900 t) clay and shale
	43,210 tons (39 200 t) industrial sand
	3,184 tons (2 889 t) marble
Employees:	18

L. E. Shaw and its subsidiary company, Nova Scotia Sand and Gravel, operate seven properties in Nova Scotia. The clay and shale are quarried from pits at Lantz, Milford and Shubenacadie (all in Hants County) and from a quarry in New Glasgow, Pictou County. The materials quarried are used in the company plant located in Lantz, Hants County, for the manufacture of bricks and tiles. The company also produces industrial sand at Elmsdale, Brazil Lake and Sandy Desert, and architectural limestone from the Marble Mountain quarry.

Brick production from the Lantz plant was 19,800,000. This plant employed an additional 55 people.

AGGREGATE RESOURCES

Crushed stone and sand and gravel comprise the structural materials category. Production information is summarized in Table B-5 and located on Figure B-6.

Crushed Stone

The province had 17 rock quarry operations that produced a total of 5,864,366 tons (5 320 118 t) in 1985 and employed 240 men.

Sand and Gravel

There were 63 private sector producers of sand and gravel operating in the province. Production was 6,623,721 tons (6 009 000 t) and 510 people were employed. Total production, which includes production for the Nova Scotia Department of Transportation, was 8,564,871 tons (7 770 000 t).

DIMENSION STONE AND PEAT MOSS PRODUCTION

The production of miscellaneous materials is shown in Table B-6. Locations are given on Figure B-5.

FIGURE B-6. Locations of aggregate producers

Dimension Stone

HERITAGE MEMORIAL LTD.

Owner:	M. Nelson
Address:	P.O. Box 308, Windsor, N.S. B0N 2T0
Production:	495 tons (449 t)
Employees:	21

The company periodically operates a small quarry at Nictaux West, Annapolis County, to obtain grey granite as part of its requirements for memorial works at Windsor. The operation depends on market requirements.

ARSENAULT MONUMENT WORKS LTD.

Owner:	P. Arsenault
Address:	P.O. Box 1475, Antigonish, N.S. B3B 2L4

Arsenault Monument Works Ltd. periodically operates a quarry at Loch Katrine, Antigonish County, for the production of dimension stone used in memorials. No production was recorded in 1986.

Peat Moss

ANNAPOLIS VALLEY PEAT MOSS CO.

President:	H. Endres
Address:	Berwick, Nova Scotia B0P 1E0
Production:	8,362 tons (7 586 t) peat moss
Employees:	44 (some part-time)

The peat bog is some 500 acres (200 ha) in area and, depending on the weather, up to 19,600 cubic feet (500 m^3) per day are harvested during the five summer months.

TABLE B-1. Metal mineral production during the 1986 calendar year.

COMPANY	LOCATION	PRODUCTION		TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
TIN					
Rio Algom Limited	East Kemptville, Yarmouth County	5,254 (tons)	4 766.5 (tonnes) tin concentrate	220	20,707,531
	TOTAL FOR BASE METAL PRODUCTION	5,254	4 766.5	220	20,707,531

[1]total number of employees including office, clerical, supervisory, mining and production
[2]estimate from Nova Scotia Department of Mines and Energy sources

TABLE B-2. Coal production during the 1986 calendar year.

COMPANY	MINE NAME	LOCATION	PRODUCTION (salable coal) tons	PRODUCTION (salable coal) tonnes	TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[3] ($)
UNDERGROUND MINING						
Cape Breton Development Corp. (CBDC)	Prince Mine Phalen Mine Lingan Mine	Point Aconi, Cape Breton County Lingan, Cape Breton County Lingan, Cape Breton County	2,659,847[2]	2 412 997[2]	3,624	
Evans Coal Mines Ltd.		St. Rose, Inverness County	38,890	35 281	45	
		TOTAL (underground)	2,698,737	2 448 278	3,669	
OPEN PIT MINING						
T. Brogan Ltd.		Point Aconi, Cape Breton County	37,920	34 401	16	
Pioneer Coal Company		Westville, Pictou County	119,526	108 433	14	
		Reserve Mines, Cape Breton County	20,840	18 906	16	
		TOTAL (open pit)	140,366	161 740	46	

TABLE B-2. Continued

COMPANY	MINE NAME	LOCATION	PRODUCTION (salable coal) tons	tonnes	TOTAL NUMBER EMPLOYED	APPROXIMATE VALUE[3] ($)
RECLAMATION						
Selminco Inc.		Sydney Mines, Cape Breton County	144,378	130 979	30	
Gael Tech Inc.		Sydney Mines, Cape Breton County	32,947	29 889	30	
		TOTAL (reclamation)	177,325	160 868	60	
		TOTAL FOR ALL COAL PRODUCERS	3,016,428	2 770 886	3,775	179,613,153

[1]personnel employed in clerical, supervisory, etc. positions as well as mining personnel
[2]washed coal
[3]estimated from Nova Scotia Department of Mines and Energy sources

TABLE B-3. Industrial minerals production during the 1986 calendar year.

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
GYPSUM					
Fundy Gypsum Co. Ltd.	Miller Creek and Wentworth, Hants County	1,660,630	1 506 514	200	
Little Narrows Gypsum Co.	Little Narrows, Victoria County	1,083,619	983 053	101	
Domtar Construction Materials Ltd.	Windsor, Hants County	11,968	10 857	12	
National Gypsum (Canada) Ltd.	Milford, Halifax County	3,135,608	2 844 605	119	
Georgia Pacific Corp.	River Denys, Inverness County	917,391	832 252	57	
Nova Construction Limited	Brierly Brook, Antigonish County	22,046	20 000	4	
	TOTAL (gypsum)	6,831,262	6 197 281	493	43,560,620
ANHYDRITE					
Fundy Gypsum Co. Ltd.	Miller Creek and Wentworth Creek, Hants County	84,523	76 679	see gypsum	
Little Narrows Gypsum Co. Ltd.	Little Narrows, Victoria County	84,927	77 045	see gypsum	
	TOTAL (anhydrite)	169,450	153 724		1,037,637

TABLE B-3. Continued

COMPANY	LOCATION		PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
SALT						
Canadian Salt Co.	Pugwash, Cumberland County		982,374	891 194	191	
Sifto Salt Division			72,604	65 866	98	
Domtar Chemical Group	Nappan, Cumberland County					
		TOTAL (salt)	1,054,978	957 060	289	47,798,837[3]
LIMESTONE						
Ridge Brokers Ltd.	Southside Harbour, Antigonish County		16,535	15 000	7	
Canada Cement Lafarge, Ltd.	Brookfield, Colchester County		483,968	439 053	18	
Scotia Limestone Ltd.	Irish Cove, Cape Breton County		nil	nil	6	
Mosher Limestone Ltd.	Upper Musquodoboit, Halifax County		98,816	89 645	29	
		TOTAL (limestone)	599,319	543 698	60	4,321,345
DOLOMITE						
Scotia Limestone	Kellys Cove, Victoria County	TOTAL (dolomite)	6,614	6 000	6	42,000
BARITE						
Nystone Chemicals Ltd.	Brookfield, Colchester County	TOTAL (barite)	3,727	3 381	10	565,221[3]

TABLE B-3. Continued

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
CLAY					
L. E. Shaw Ltd.	Lantz, Halifax County Shubenacadie, Halifax County	28,990	26 300	4	157,800
SHALE					
L. E. Shaw Ltd.	Milford, Hants County New Glasgow, Pictou County	20,503	18 600	see clay	111,600
	TOTAL (clay and shale)	49,493	44 900	4	269,400
SILICA SAND					
Nova Scotia Sand and Gravel Ltd.	Nine Mile River, Hants County TOTAL (silica sand)	43,210	39 200	14	1,532,982[3]
	TOTAL FOR INDUSTRIAL MINERALS	8,758,053	7 945 244	876	99,128,042

[1]total employees: mining, production, clerical, supervisory, etc.
[2]estimate from Nova Scotia Department of Mines and Energy sources
[3]processed or manufactured value

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TABLE B-4. Secondary mineral manufacturing during the 1986 calendar year.

COMPANY	LOCATION	PRODUCTION		TOTAL[1] NUMBER EMPLOYED	APPROXIMATE VALUE[2] ($)
MANUFACTURED BRICKS					
L. E. Shaw Ltd.	Lantz, Halifax County	19,800,000 Bricks		55	6,930,000
PORTLAND CEMENT					
Canada Cement Lafarge Ltd.	Brookfield, Colchester County	220,036 (tons)	199 616 (tonnes)	71	26,150,000
TOTAL FOR SECONDARY MINERAL MANUFACTURING				126	33,080,000

[1]total number of employees including office, clerical, supervisory, mining and production
[2]estimate from Nova Scotia Department of Mines and Energy sources

TABLE B-5. Aggregate materials production during the 1986 calendar year.

COMPANY	LOCATION (Head Office)	PRODUCTION TONS	PRODUCTION TONNES	NUMBER EMPLOYED[1]	APPROXIMATE VALUE ($)[2]
CRUSHED STONE					
1. Conrad Brothers Ltd.	Montague, Halifax County	111,870	1 001 488	50	
2. Doug Burns Excavation Contracting Ltd.	Sydney, Cape Breton County	68,501	621 44	5	
3. Construction Aggregates Ltd.	Mulgrave, Guysborough County	1,128,259	1 023 550	46	
4. Dexter Construction Ltd.	Bedford, Halifax County	245,835	223,020	—	
5. Gateway Materials Ltd.	Kearney Lake Rd., Halifax County	683,636	620 191	23	
6. LeVatte Construction Company Ltd.	Sydney, Cape Breton County	77,161	70 000	9	
7. Rocky Lake Quarry Ltd.	Bedford, Halifax County	1,598,335	1 450 000	28	
8. Satellite Equip. (1972) Ltd.	New Glasgow, Pictou County	11,023	10 000	11	
9. South Shore Sand & Gravel Ltd.	Bridgewater, Lunenburg County	139,220	126 300	10	
10. Steed & Evans Ltd.	Dartmouth, Halifax County	46,296	42 000	12	
11. S. W. Weeks Const. Ltd.	New Glasgow, Pictou County	230,333	208 957	16	
12. W. Eric Whebby Ltd.	Dartmouth, Halifax County	83,542	75,789	5	
	TOTAL (crushed stone)	4,424,011	4 913 439	215	24,419,792
SAND AND GRAVEL					
13. Aberdeen Paving Ltd.	Halifax, Halifax County	489,421	444 000	38	
14. Acadia Road Contractors Ltd.	Bridgewater, Lunenburg County	101,409	91 998	6	
15. Bert Balcon Excavating	Middleton, Annapolis County	52,784	47 886	8	
16. Briggs Construction	Bras D'Or, Cape Breton County	9,369	8 500	7	
17. Budget Paving Ltd.	Liverpool, Queens County	10,417	9 450	4	
18. Chaisson Brothers Ltd.	Cheticamp, Inverness County	15,432	14 000	3	

TABLE B-5. Continued

COMPANY	LOCATION (Head Office)	PRODUCTION TONS	PRODUCTION TONNES	NUMBER EMPLOYED[1]	APPROXIMATE VALUE ($)[2]
19. Clearland Enterprises Ltd.	Mahone Bay, Lunenburg County	25,072	22 745	11	
20. Jerry S. Coulter Ltd.	Wallace, Cumberland County	4,878	4 425	3	
21. Gordon F. Creelman Ltd.	Stewiacke, Colchester County	11,023	10 000	2	
22. Cumberland Paving & Contr. Ltd.	Amherst, Cumberland County	127,867	116 000	16	
23. Gus D'Eon Excavating Ltd.	West Pubnico, Yarmouth County	32,738	29 700	6	
24. Dewdrop Gardens	Sheet Harbour, Halifax County	2,678	2 430	1	
25. Dexter Construction Ltd.	Bedford, Halifax County	311,069	282 200	5	
26. Dillman Enterprises Ltd.	Shubenacadie, Colchester County	749,443	679 890	18	
27. Dominion Atlantic Railway (C.P.R.)	Saint John, New Brunswick	38,580	35 000	—	
28. Dunn Const. Co. Ltd.	Baddeck, Victoria County	142,946	129 680	7	
29. R. B. Furguson Construction	Sydney, Cape Breton County	33,069	30 000	4	
30. G. & B. Construction Ltd.	Nappan, Cumberland County	3,858	3 500	6	
31. John W. Fancy & Sons Ventures Ltd.	Bridgewater, Lunenburg County	5,952	5 400	3	
32. L. & M. Gallant Contr., Trucking Ltd.	Elmsdale, Hants County	46,297	42 000	3	
33. Gillis Const (C.B.) Ltd.	Baddeck, Victoria County	2,094	1 900	1	
34. W. C. Hall & Sons Excavating Ltd.	Cornwallis, Annapolis County	15,625	14 175	5	
35. Hatchet Lake Excavations	Armdale, Halifax County	17,857	16 200	7	
36. Roy Hiltz Excavators Ltd.	Kingston, Kings County	70,179	63 666	5	
37. M. D. Holmes Trucking Ltd.	Stellarton, Colchester County	46,297	42 000	4	
38. Inter Supply Ltd.	New Glasgow, Pictou County	121,253	110 000	12	
39. Francis Johnson Ltd.	Head Chezzetcook, Halifax County	16,534	15 000	15	
40. G. K. Keddy (L. E. Shaw)	Lantz, Hants County	205,458	186 390	11	
41. Kell's Enterprises Ltd.	Antigonish, Antigonish County	18,739	17 000	5	
42. Latimer Construction Ltd.	Truro, Colchester County	551	500	1	
43. LeVatte Construction Company Ltd.	Sydney, Cape Breton County	187,369	169 980	7	
44. D. J. Lowe Ltd.	Deep Brook, Annapolis County	27,557	25 000	5	

TABLE B-5. Continued

COMPANY	LOCATION (Head Office)	PRODUCTION TONS	PRODUCTION TONNES	NUMBER EMPLOYED[1]	APPROXIMATE VALUE ($)[2]
45. Colin R. MacDonald Ltd.	Antigonish, Antigonish County	272,319	247 041	26	
46. Malcolm S. MacDonald Co. Ltd.	Sydney River, Cape Breton County	79,371	72 005	23	
47. J. P. MacInnis Trucking	Whycocomagh, Inverness County	2,976	2 700	2	
48. Martell's Const. Ltd.	North Sydney, Cape Breton County	276,330	250 685	15	
49. Maurice's Ready-Mix Ltd.	Kentville, Kings County	69,551	63 096	3	
50. Meadows Sand & Gravel Ltd.	Sydney, Cape Breton County	93,696	85 000	8	
51. Moore Enterprises	Deep Brook, Digby County	13,228	12 000	3	
52. Mosher & Rawding Ent. Ltd.	Liverpool, Queens County	73,359	66 550	5	
53. Municipal Ready-Mix Ltd.	Sydney, Cape Breton County	373,217	338 580	12	
54. Nova Scotia Sand & Gravel Ltd.	Halifax, Halifax County	314,714	285 507	43	
55. Permanent Concrete Ltd.	Folly Lake, Cumberland County	315,333	286 068	12	
56. H. W. Phillips Ltd.	Mira Gut, Cape Breton County	44,092	40 000	4	
57. Pictou County Excavators Ltd.	New Glasgow, Pictou County	13,779	12 500	9	
58. H. Plehn	Lawrencetown, Annapolis County	13,976	12 679	2	
59. Scott Paper International	New Glasgow, Pictou County	204,894	185 879	2	
60. Reid J. Shanks Ltd.	Windsor, Hants County	16,535	15 000	16	
61. W. K. Sharpe and Sons Construction Ltd.	Avonport, Kings County	22,046	20 000	5	
62. V. H. Shaw	Avonport, Kings County	113,394	102 870	2	
63. D. M. Snow Construction	Barrington Passage, Shelburne County	8,929	8 100	4	
64. Standard Paving Maritime Ltd.	Halifax, Halifax County	359,170	325 837	17	
65. Timberland Holdings	Hantsport, Hants County	935	848	1	
66. Earle Toole Trucking Ltd.	Truro, Colchester County	24,256	22 005	5	
67. Warren Maritimes Ltd.	New Glasgow, Pictou County	264,530	239 980	5	
68. Herbert Waugh	Malagash, Colchester County	1,488	1 350	3	
69. F. Webber	Oyster Pond, Halifax County	1,399	1 269	2	
70. Wetlands Construction	Pugwash, Cumberland County	4,079	3 700	2	

TABLE B-5. Continued

COMPANY	LOCATION (Head Office)	PRODUCTION TONS	PRODUCTION TONNES	NUMBER EMPLOYED[1]	APPROXIMATE VALUE ($)[2]
71. Max White Excavating	Porters Lake, Halifax County	1,786	1 620	4	
72. Will-Kare Paving & Const. Ltd.	Truro, Colchester County	230,767	209 350	7	
73. Yarmouth Concrete & Gravel Ltd.	Yarmouth, Yarmouth County	173,589	157 479	9	
74. Zutphen Brothers Const. Ltd.	Port Hood, Inverness County	110,230	100 000	5	
	Subtotal	6,437,783	5 840 313	485	23,600,774
NON-REPORTING (mainly Nova Scotia Department of Transportation)		1,678,075	1 522 340	58	6,348,158
	TOTAL (sand and gravel)	8,115,858	7 362 653	543	29,948,932
TOTAL FOR AGGREGATE MATERIALS PRODUCTION		12,539,869	12 276 092	758	54,368,724

[1]Locations of Head Offices are shown by number on Figure.
[2]Estimate from Department of Mines and Energy sources.

TABLE B-6. Dimension stone and peat moss production during the 1986 calendar year.

COMPANY	LOCATION	PRODUCTION tons	PRODUCTION tonnes	TOTAL NUMBER EMPLOYED[1]	APPROXIMATE VALUE[2] ($)
DIMENSION STONE					
Heritage Memorials Ltd.	Quarry: Nictaux, Annapolis County Plant: Windsor, Hants County	494	449	21	56,125
Nova Scotia Sand and Gravel	Quarry: Marble Mountain, Inverness County	3,184	2 889	4	17,334
Stanley Flynn	Quarry: Wallace, Cumberland County	217	197	4	24,625
	TOTAL (dimension stone)	3,895	3 535	29	98,084
PEAT MOSS					
Annapolis Valley Peat Moss Company	Berwick, Kings County				
	TOTAL (peat moss)	8,362	7 586	44	1,661,344[3]
TOTAL FOR MISCELLANEOUS COMMODITY PRODUCTION		12,257	11 121	73	1,759,428

[1]total number of employees including office, clerical, supervisory, mining and production
[2]estimate from Nova Scotia Department of Mines and Energy sources
[3]processed or manufactured value

APPENDIX C

PRIVATE SECTOR EXPLORATION AND DEVELOPMENT

EXPLORATION ACTIVITY

The level of mineral exploration activity increased significantly during 1986 with total expenditures estimated at $20 million (all minerals except petroleum), more than double the $9 million spent in 1985. Exploration for gold continues to dominate exploration activities in the province, followed by coal and industrial minerals. Expenditure levels for gold exploration reached record levels during 1986, in contrast to base metals which continued to fall below the already low levels of the previous year.

A major factor in the current level of gold exploration has been the success with which junior companies have been able to raise financing through "flow-through shares" funding. This ability to raise large amounts of exploration capital has given junior companies the opportunity to participate in large scale exploration programs which have generally been ignored by the larger companies in recent years. Increased expenditure levels have resulted in several of the historic gold properties being brought to advanced stages of exploration in recent months.

Large scale exploration programs for gold were undertaken by many companies (Fig. C-1) including Seabright Resources Incorporated (Forest Hill, Beaver Dam, Moose River), SCOMINEX (Cochrane Hill, Cape Breton Highlands), Pan East Resources Incorporated (Fifteen Mile Stream), Acadia Mineral Ventures Limited (Mooseland, Renfrew), Cobequid Resources Limited (Country Harbour), Coxheath Gold Holdings Limited (Tangier), Novacan Mining Resources (1985) Limited (Fifteen Mile Stream), Torene Gold Explorations Incorporated (Harrigan Cove) and BP Resources Canada Limited (Faribault Brook).

MINERAL EXPLORATION

Gold. Exploration for gold continued to dominate the search for metallic mineral deposits in the province during 1986. Interest was concentrated primarily on the historic gold districts of mainland Nova Scotia between Canso and Yarmouth, where gold-bearing quartz veins occur in the Cambro-Ordovician rocks of the Meguma Group. Interest has also been directed to the Cambrian and Hadrynian rocks in other areas of the province including southeastern Cape Breton Island, the Cape Breton Highlands and the Antigonish Highlands.

Most of the exploration for gold was undertaken by junior companies with interest from major companies restricted primarily to regional grass-roots programs. A significant increase in the level of gold exploration was recorded in 1986 over the previous year with the implementation of several large-scale exploration and development projects (Fig. C-1). While several of the programs were new projects, the majority of the work was continued from the previous year.

Seabright Resources Incorporated continued a detailed surface exploration program and underground development work on the Forest Hill property in Guysborough County during 1986. A 230 m (755 ft.) exploration shaft was completed on the Forest Hill property (Teasdale Mine) to facilitate underground bulk sampling of drill indicated ore reserves. Surface exploration included stripping operations and core drilling of the east strike extension of the main ore zones. Detailed geochemical and geophysical surveys and geological mapping were also conducted on other areas of the property.

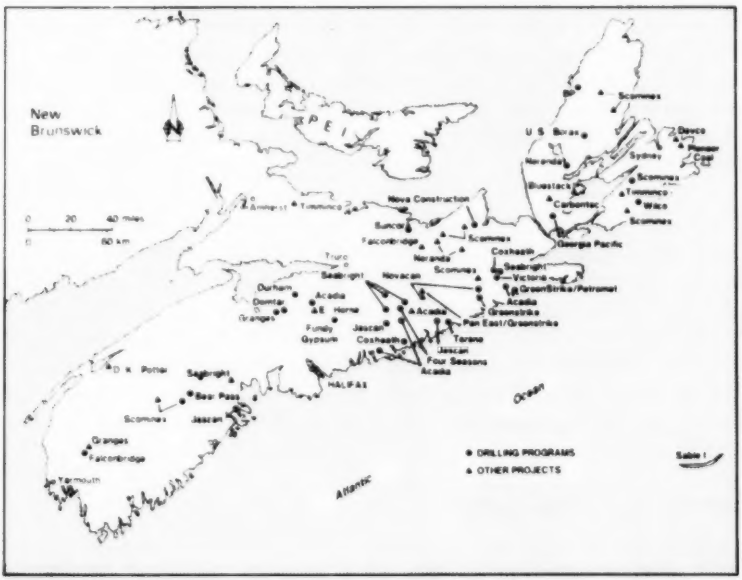

FIGURE C-1. Locations of private sector mineral exploration projects.

A detailed exploration program was also continued by Seabright on the Beaver Dam property in Halifax County. Beginning in the fall of 1985, Seabright initiated a large-scale drilling program, completing over 150 holes by the end of 1986. Detailed geochemical and geophysical surveys, geological mapping and

deep overburden sampling were also undertaken on the property and regional surface exploration programs were carried out on adjoining ground.

An underground bulk sampling program was started in mid-1986 with the construction of a decline in the immediate vicinity of the old workings. Underground bulk samples from both the Forest Hill and Beaver Dam sites were processed at the recently acquired Gays River mill near Halifax. The mill has undergone minor modifications and refurbishing to process gold ore.

Additional work was undertaken by Seabright at the Moose River property in Halifax County, consisting of ground geophysical surveys and extensive core drilling. A detailed examination of the Lake Charlotte gold property was also carried out by Seabright, which included geological mapping, geochemical and geophysical surveys and trenching. A small surface exploration program was undertaken by the company at Gold River, Lunenburg County.

The SCOMINEX group (under Inco Limited management) carried out an underground bulk sampling and core drilling program on the Cochrane Hill gold property, Guysborough County, in early 1987. Bulk samples were processed on site, utilizing the Northumberland Mines limited mill facilities. A surface core drilling program was also undertaken on the property.

A drilling program was initiated by the SCOMINEX group on the Molega gold property in Queens County and a reconnaissance exploration program for gold was undertaken in the Caledonia area, Queens County. The SCOMINEX group also continued a detailed evaluation of the gold potential in the eastern regions of the Cape Breton Highlands and in Cape Breton County, southwest of Sydney. Work consisted of reconnaissance soil geochemical surveys, lithological sampling and geological mapping. Initial follow-up work from this project consisted of a small surface program, including core drilling at Ben Eoin, Cape Breton County.

A large core drilling program was undertaken by Coxheath Gold Holdings Limited on the Tangier gold property in Halifax County to evaluate ore reserves outlined by drilling in 1985. The company also initiated an underground bulk sampling program on the property, with the construction of a decline to access a series of drill indicated ore zones. In addition, a small gold processing mill was set up on the property to begin evaluation of the bulk samples. Coxheath completed detailed geochemical and geophysical surveys and a core drilling program on the Mile Lake property, 2 km west of the Teasdale Mine at Forest Hill.

Novacan Mining Resources (1985) Limited carried out a detailed exploration program at the Fifteen Mile Stream gold property, Halifax County,

consisting of geochemical and geophysical surveys, geological mapping, trenching and core drilling. Pan East Resources Incorporated also resumed work on its adjoining property in late 1985, which included ground geophysical surveys and a core drilling program. The Pan East program is a joint venture project with Greenstrike Gold Corporation. Novacan also completed a surface exploration program at Cranberry Lake, south of Cochrane Hill, involving of ground geophysical surveys and core drilling.

Acadia Mineral Ventures Limited completed geochemical and geophysical surveys and a core drilling program on the Renfrew gold property in Hants County and, in early 1987, began a detailed exploration program consisting of ground geophysical surveys and core drilling at Mooseland, Halifax County. The company also completed drilling programs on the Clam Harbour and Killag gold properties in Halifax County. Cobequid Resources Limited, an associated company under Acadia management, completed ground geophysical surveys and core drilling on the Widow Point property near Country Harbour, Guysborough County.

Jascan Resources Incorporated completed a surface exploration program consisting of trenching and core drilling on the Gold Lake (Scraggy Lake) gold property in Halifax County, and completed similar work on the Indian Path gold-tungsten property in Lunenburg County. The company also carried out a core drilling program on the Salmon River gold property in Halifax County.

Several additional gold exploration programs in the Meguma were completed during fiscal 1986. Torene Gold Explorations Incorporated carried out geochemical and geophysical surveys and core drilling on the Harrigan Cove gold property, Halifax County. Four Seasons Resources Incorporated completed geochemical and geophysical surveys and a core drilling program 1.5 km (1 mi.) west of the Beaver Dam gold property in Halifax County. Victoria Resource Corporation carried out trenching and a core drilling program 2 km south of the Forest Hill gold property in Guysborough County, and Granges Exploration Limited completed a small program of ground geophysics and core drilling on the McKay Settlement gold property in Hants County. Greenstrike Gold Corporation carried out core drilling in early 1987 on the Goldenville and Upper Seal Harbour gold properties in Guysborough County. Acadia Mineral Ventures Limited completed ground geophysical surveys on the Carleton gold property in Yarmouth County.

Several exploration programs for gold were also undertaken on other geological environments throughout the province. BP Resources Canada Limited completed the second year of a detailed exploration program for gold and base metals in the Faribault Brook area east of Cheticamp, Inverness County. Work included detailed geochemical and geophysical surveys,

geological mapping and a core drilling program. U.S. Borax carried out ground geophysical surveys and a core drilling program 1.5 km (1 mi.) east of the Second Gold Brook property in Victoria County, and Seabright Resources Incorporated completed a core drilling program near Farmington, Cumberland County. Noranda Exploration Company Limited continued a small-scale reconnaissance program in the Antigonish Highlands and completed a follow-up program in the Whycocomagh area, Inverness County.

In addition to the above exploration programs, several small-scale exploration projects were carried out for gold by various companies and individuals throughout the province.

Base Metals. Exploration for tin was confined to the Devono-Carboniferous intrusives of the South Mountain Batholith, southwest of the East Kemptville tin deposit. Falconbridge Limited completed a core drilling program at Kempt Snare Lake and Granges Explorations Limited continued work consisting of geochemical surveys and geological mapping on ground held in the Peters Lake area, Yarmouth County.

Exploration for the traditional base metals — copper, lead and zinc — was carried out in the Fourchu Group of southeastern Cape Breton Island and in similar age rocks of the Cape Breton Highlands. Wilco Mining Company Limited initiated the second phase of a detailed drilling program for base metals on the Stirling program late in the year and BP Resources Canada Limited carried out a detailed exploration program for gold and base metals near Cheticamp, Inverness County.

Durham Resources Incorporated drilled additional holes on the West Gore gold-antimony property, Hants County in early 1987.

Celestite. Exploration for celestite was continued by Timminco Limited on two separate properties during 1986 under the direction of A.C.A. Howe International Limited. Bulk samples taken in late 1985 from the Beckwith deposit in Cumberland County and the Lake Enon deposit in Cape Breton County were shipped to Lakefield Research for metallurgical testing. Core drilling was also carried out on the Beckwith property following the completion of the bulk sampling program.

Limestone. Canada Cement Lafarge Limited continued a detailed evaluation of several limestone properties in central mainland Nova Scotia during the year. Chapman Brothers of Souris, P.E.I. completed drilling on a limestone property at Pugwash, Cumberland County.

Gypsum. Nova Construction Company Limited completed a detailed core drilling program on a gypsum property at Brierly Brook, Antigonish County.

Silica. Nova Scotia Sand and Gravel Limited completed additional bulk sampling of a silica sand prospect near Elmsvale, Halifax County.

Graphite. An exploration program consisting of ground geophysics and trenching was carried out by Carbontec Industries Limited on a graphite property at Glendale, Inverness County.

Magnetite. Lodestone Limited completed an exploration program on the Bass River magnetite property, Colchester County consisting of ground geophysics, trenching and drilling.

Wollastonite. An exploration program for wollastonite was carried out on the Lime Hill zinc property, Inverness County by Bluestack Resources Limited consisting of prospecting and detailed trenching.

Coal and Oil Shale. The Nova Scotia Department of Mines and Energy continued a detailed assessment of the Pictou coal basin during the year. Exploration drilling was carried out in two areas, including one hole at Fraser's Mountain and one hole at Chance Harbour.

MINING DEVELOPMENT

Gold. Seabright Resources Incorporated continued underground development work on the Forest Hill property in Guysborough County during 1986. A 230 m (755 ft.) shaft was completed in the fall followed by drifting and cross-cutting on the 200 m (655 ft.) level to access drill indicated ore zones for bulk sampling.

The company also initiated development work on the Beaver Dam property in Halifax County. The construction of a decline was started mid-year followed by drifting and cross-cutting to facilitate bulk sampling of the drill indicated ore reserves.

Coxheath Gold Holdings also started the construction of a decline on the Tangier gold property in Halifax County to facilitate bulk sampling of drill indicated ore zones.

Gypsum. Several development projects were undertaken by gypsum producers in the province during the year as part of a continuing program to develop gypsum reserves. Fundy Gypsum Company Limited carried out a large core drilling program on the Dutch Settlement gypsum deposits in Halifax County,

and Domtar Construction Materials completed a core drilling program on the McKay Section gypsum deposits in Hants County. Georgia Pacific Corporation also continued development drilling at Sugar Camp, Inverness County in preparation for commencement of operations.

Stone. Development work was carried out by B. MacKenzie on a sandstone quarry at Hardwood Hill, Pictou County for various types of fill material.

Coal. The Cape Breton Development Corporation continued development work on two major projects in the Sydney coal basin during 1986. The work included the driving of the main access slope at the Phalen Colliery as part of the Lingan/ Phalen project and a second access slope was being constructed at the Donkin/ Morien development project.

Pioneer Coal Company, a subsidiary of Nova Construction Company of Antigonish, carried out development work on the Gardiner Seam at Reserve, Cape Breton County, consisting of core drilling and preparations for an open pit operation.

Suncor Incorpoated continued detailed studies on the New Glasgow area coal project. A production decision, anticipated in the summer of 1986, was deferred pending the acquisition of a partner. In Feburary 1987, a five-month 100% option was arranged with Placer Development Ltd., who funded additional drilling and geotechnical studies.